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ABSTRACT

The purpose of the Committee on Basic Research in Education is to provide advice to the Office of Education on the organization of a comprehensive program of support for basic behavioral, social and humanistic research of relevance to education. This document presents: (1) the history and goals of the Committee on Basic Research; (2) the activities of the Committee; (3) the role of the disciplines in basic research related to education; (4) the role of problem centered inquiry in basic educational research; and (5) recommendations of the committee. Also included is a brief history of the national Academy of Sciences, the National Research Council, and the National Academy of Education. (HS)

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Final Report of the COMMITTEE ON BASIC RESEARCH IN EDUCATION

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DIVISION OF BEHAVIORAL SCIENCES

National Academy of Sciences—National Research Council
Washington, D.C. September 1972

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Final Report of the COMMITTEE ON BASIC RESEARCH IN EDUCATION

DIVISION OF BEHAVIORAL SCIENCES

National Academy of Sciences—National Research Council
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NOTICE

The study reported herein was undertaken under the aegis of the National Research Council with the express approval of the Governing Board of the National Research Council. Such approval indicated that the Board considered that the problem is of national significance; that elucidation or solution of the problem required scientific or technical competence and that the resources of the National Research Council were particularly suitable to the conduct of the project. The institutional responsibilities of the National Research Council were then discharged in the following manner:

The members of the study committee were selected for their individual scholarly competence and judgment with due consideration for the balance and breadth of disciplines. Responsibility for all aspects of this report rests with the study committee, to whom our sincere appreciation is expressed.

Although the reports of our study committees are not submitted for approval to the Academy membership nor to the Council, each report is reviewed by a second group of appropriately qualified individuals according to procedures established and monitored by the Academy's Report Review Committee. Such reviews are intended to determine, inter alia, whether the major questions and relevant points of view have been addressed and whether the reported findings, conclusions, and recommendations arose from the available data and information. Distribution of the report is approved, by the President, only after satisfactory completion of this review process.

Preface

The Committee on Basic Research in Education was established in 1968 as a result of cooperation among the Office of Education, U. S. Department of Health, Education, and Welfare, the Division of Behavioral Sciences, National Academy of Sciences-National Research Council, and the National Academy of Education. The purpose of the Committee was to provide advice to the Office of Education on the organization of a comprehensive program of support for basic behavioral, social, and humanistic research of relevance to education. This report describes the history, activities, and recommendations of the Committee.

We think it is appropriate to describe the National Academy of Sciences, the National Research Council, and the National Academy of Education, to acknowledge the contributions of individuals who have been involved in the Committee's four years of work, and to provide an explanatory note about the authorship of this report.

The National Academy of Sciences

The National Academy of Sciences is a private honorary organization of over 850 scientists and engineers elected to lifetime membership on the basis of outstanding contributions to knowledge. Established by a Congressional Act of Incorporation signed by Abraham Lincoln on March 3, 1863, and supported by private and public funds, the Academy works to further science and its use for the general welfare by bringing together notably qualified individuals to deal with scientific and technological problems of broad significance.

Under the terms of its Congressional charter, the Academy is also called upon to act as an official--yet independent--adviser to the federal

government in matters of science and technology. This provision accounts for the close ties that have always existed between the Academy and the government, although the Academy is not a governmental agency and its activities are not limited to those on behalf of the government.

The National Research Council

The National Research Council is an agency organized in 1916 by the National Academy of Sciences, at the request of President Wilson, to enable the broad community of United States scientists and engineers to associate their efforts with those of the more limited membership of the Academy in service to science and the nation. It now serves both the National Academy of Sciences and the National Academy of Engineering in the discharge of their responsibilities. The members of the Council and the members of its committees, boards, and panels are drawn from governmental, academic, industrial, and other private organizations and institutions throughout the country.

Supported by private and public contributions, grants, and contracts, and with voluntary contributions of time and effort by several thousand of the nation's leading scientists and engineers, the Academies and the Council work to serve the national interest, to foster the sound development of science and engineering, and to promote their effective application for the benefit of society.

The National Academy of Education

The purpose of the National Academy of Education is to promote scholarly inquiry and discussion concerning the end and means of education, in all its forms, in the United States and abroad. Its membership represents a wide variety of disciplinary backgrounds, institutional affiliations, and educational

viewpoints. The Constitution of the Academy provides for a regular membership of 50 persons whose scholarly and scientific writings on the subject of education are judged outstanding. The members are arranged in four sections of 10 members each: (1) the history and philosophy of education; (2) the politics, economics, sociology, and anthropology of education; (3) the psychology of education; and (4) the study of educational practice. In addition, a maximum of 10 persons, whose accomplishments in the field of education are judged outstanding but whose writings need not identify them with one of the sections, may be elected members-at-large. A small number of members emeriti and foreign associates also participate as fully as possible in Academy activities.

Chartered in 1965 by the Board of Regents of New York, the Academy meets semi-annually to discuss appropriate questions of educational theory and practice. Committees of the Academy have also prepared reports from time to time on specific issues of educational policy, both on the initiative of the membership and at the invitation of governmental agencies. The Academy has also sought to encourage fruitful research on education by younger scholars through several of its programs. The activities of the Academy have been supported by generous grants from the Carnegie Corporation of New York, the Spencer Foundation, and the Ford Foundation.

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Committee on Basic Research in Education

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Acknowledgments

The Committee on Basic Research in Education would like to acknowledge its debt to several colleagues who served on the Committee during its early stages: R. Taylor Cole, Lawrence A. Cremin, John I. Goodlad, Louis Hartz, and Fritz Machlup. Although Professor Cremin officially resigned from the Committee in late 1969, he has continued to contribute to the activities and discussions of the Committee when his help was requested. We should also note that Committee member John B. Carroll assumed the duties of the vice-chairman during the absence on leave of James S. Coleman in 1971; Bruce K. Eckland shared these duties during part of that time.

We would like to thank the many junior and senior staff officers of the National Center for Educational Research and Development (NCERD), Office of Education, U. S. Department of Health, Education, and Welfare, who have been responsive and helpful on large and small issues. In particular, we want to thank Howard Hjelm, Thomas Moorefield, and Glenn Boerrigter. COBRE has enjoyed particularly good relations with its sponsor, one indication of which is that many of the recommendations made later in this report have already been incorporated into the programs of NCERD.

The Committee is also greatly indebted to the many scientific colleagues who acted as outside reviewers of research proposals. Other colleagues it wishes to thank are the participants in the research workshops, whose names appear in Appendix 4. The coordinators of the research workshops, Lee Ehrman, Roy O. Freedle, Elizabeth Gammon, Michael W. Kirst, Edwin Martin, James Michaels, and Kenneth Wexler, deserve a special note of thanks.

The staff and officers of the National Academy of Education have been

unfailingly supportive of the Committee's activities.

Finally, the Committee wishes to acknowledge the assistance of the staff of the Division of Behavioral Sciences, National Academy of Sciences-National Research Council, especially Henry David, the Executive Secretary of the Division, Alexander L. Clark, Acting Executive Secretary of the Division from September 1969 to September 1970, and Mrs. Carole W. Parsons, Staff Associate of the Division. Miss Martha Fleischer was the secretary during COBRE's early life.

A Note on Authorship

Although this report represents the effort and the opinions of the entire Committee, having been discussed and reviewed at length by the Committee at various points in its development, several sections were written by Committee members whose contributions should be acknowledged. A subcommittee of the Committee, composed of Patrick Suppes and John B. Carroll, was responsible for preparing the first draft of the manuscript. Chapter 3 contains sections written by individual Committee members concerning their particular fields of professional interest. A certain amount of resulting redundancy in this chapter has been allowed to remain since further editing might damage the individual pieces. The background materials in Chapters 1 and 2 were prepared by the staff of the Committee, who were also responsible for final editing of the report. Mrs. Carol R. Potts, Administrative Secretary to Dr. Henry David, typed the report.

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CHAPTER 1

THE HISTORY AND GOALS OF THE COMMITTEE ON BASIC RESEARCH IN EDUCATION

The Committee on Basic Research in Education (COBRE) was established following discussions in 1967 among Henry David, Executive Secretary of the Division of Behavioral Sciences, National Academy of Sciences-National Research Council (NAS-NRC), Lawrence A. Cremin, then Vice-President of the National Academy of Education (NAE), and R. Louis Bright, then Associate Commissioner for Research of the U. S. Office of Education (OE).

In a request to the NAS-NRC dated October 17, 1967, Commissioner Bright noted that much of the research that had been supported by the OE had been "of a very applied character" and he commented on the great need for "truly basic studies." He estimated that the OE was then spending less than $1 million a year to support research that might be classified as basic, but indicated that its intention was to increase expenditures for such research to somewhere between $20 and $30 million a year by 1973. For fiscal year 1969 the OE was to allocate about $4 million to basic research. To aid in the wise expenditure of such funds, and to provide guidance for the future direction of a basic research program, he proposed that a committee be established jointly by the National Academy of Education and the NAS-NRC. This committee would identify needed basic research and set forth a program designed to encourage scientists to participate in such research. It would recommend research projects falling within the purposes and scope of the program for funding by the OE. It would operate for three years, and each year would assume responsibility for recommending expenditures on basic research equivalent to a substantial proportion of the OE's allocations for such

research. For the first year, the committee would recommend as many projects as could be supported by about $1 million.

It was natural for Commissioner Bright to approach the National Academy of Education and the NAS-NRC. The latter organization had for many years operated as a point of contact between government agencies and the scientific community, although it had previously had little involvement with the OE and educational researchers. The National Academy of Education had been founded in 1965 "to promote scholarly inquiry and discussion concerning the ends and means of education, in all its forms," and even by 1967 had shown its concern with stimulating imaginative and fruitful research in education and promoting high standards of educational scholarship. The National Academy of Education had formed a standing Committee on Educational Research, chaired by Lee J. Cronbach, the membership of which included a number of prominent scholars in several fields of education.

In response to the Office of Education's request, the Executive Committee of the Division of Behavioral Sciences took formal action at its meeting of October 20, 1967, to establish a Committee on Basic Research in Education jointly with the National Academy of Education. The National Academy of Education took similar action in the same month, its President, Ralph Tyler, expressing appreciation for the opportunity to cooperate with the Division in developing a basic research in education program. The National Academy of Education empowered Lawrence A. Cremin to act for it in working out the terms of this joint effort.

Shortly thereafter, the Division and the National Academy of Education developed a proposal requesting support for a fifteen-member multidisciplinary committee, whose composition would be jointly determined by the

Division and the National Academy of Education. The Division would be administratively responsible for the work of the committee.

A contract between the National Academy of Sciences and the Office of Education for the work of the committee was signed in April 1968. Through joint consultation between the Division and the National Academy of Education, 14 scholars were appointed as charter members of the committee. In addition to the 10 present Committee members listed on page iv, these included:

R. Taylor Cole, Duke University (Political Science)

Lawrence A. Cremin, Teachers College, Columbia University (History of Education)

John I. Goodlad, University of California at Los Angeles (Administration, Curriculum)

Fritz Machlup, Princeton University (Economics)

Meetings and Further History

In all, the Committee on Basic Research in Education held eight meetings, as follows:

June 13, 1968--Washington, DC

December 7, 1968--Washington, DC

March 1-2, 1969--Washington, DC

May 10, 1969--Washington, DC

September 12-13, 1969--Charlottesville, Virginia

December 12-13, 1969--Washington, DC

April 3-4, 1970--Washington, DC

January 22-23, 1971--Palo Alto, California

There were changes in the composition of the COBRE during the course of its life. Professor Machlup resigned in February 1969; Professors Cole

and Goodlad resigned July 31, 1969, and Professor Cremin resigned December 1 1969. John B. Carroll, Robert M. Gagné, H. Thomas James, and Theodore W. Schultz were appointed to the Committee August 1, 1969. Louis Hartz, Harvard University, also appointed to the Committee at that time, found that he was unable to serve, and resigned November 1969.

According to its contract, the scope of work of the Committee on Basic Research in Education would include:

(1) Development of strategic approaches to basic research in education;

(2) Preparation of guidelines for a coherent, multidisciplinary program of basic research studies;

(3) Identification of potential researchers of high quality;

(4) Invitation and even active solicitation of relevant research proposals;

(5) Screening and assessment of these proposals; and

(6) Selection of those research proposals to be recommended to the Office of Education for funding.

The OE would arrange the contracts administratively and be responsible for monitoring them.

Derived from the original plans laid down for the Committee, its major activities can be described under three headings, as follows:

(1) Development and implementation of a program of major basic research grants;

(2) Sponsorship of a series of research workshops in eight major fields of social science related to education; and

(3) Development and implementation of a program of small grants

in basic research, to encourage research by younger scholars.

In addition to those activities involving actual support for research, the Committee spent several meetings discussing strategic approaches and guidelines for basic research programs. These discussions focused on two general, interrelated issues: (1) What research questions are most likely to produce interesting and important results? (2) What kinds of programs will encourage high quality research on those questions?

Chapter 2 describes the three major research support activities of the Committee, and Chapters 3 and 4 describe its conclusions about more general issues, based on its experience and discussion. In Chapter 5, the Committee summarizes its recommendations.

CHAPTER 2

THE ACTIVITIES OF THE COMMITTEE ON BASIC RESEARCH IN EDUCATION

Program of Major Grants

For each of its first two years of activity, the Committee on Basic Research in Education was asked by the Office of Education to recommend a program costing $1 million. At its first meeting, on June 13, 1968, COBRE decided to initiate a program of support for unsolicited "major" grants in basic research in education, reasoning that such a program would meet several interesting objectives. First, it would enable the Committee members to show how such a program could be developed and managed. Second, it would attract the attention of scholars who might not otherwise be disposed to devote their energies to basic studies in education. Third, it would directly help basic study in education by increasing the funds available for these studies. The Committee realized that $1 million was not really a large amount of money, and wanted to spread the sum as widely as possible. However, the Committee also wanted to avoid putting undue limits on the amount awarded to any one applicant. The Committee thought that grants in the range of $20,000 - $100,000, for the terms of one or two years, would be of a suitable magnitude.

At its first meeting, COBRE also established guidelines for preparing an announcement of the new program, the schedule for grants and awards, and the procedures for screening research applications. It further arranged for preparation of an instruction manual on the form of grant applications and made plans for the distribution of the brochure announcing the program. Brochures were subsequently distributed to over 1,300 graduate departments

of behavioral sciences (psychology, sociology, education, history, business, anthropology, economics, political science, linguistics, medicine, and biosciences), as well as to other lists of selected scholars, administrators, and institutions (Appendix 1). The first distribution took place in August and September 1968; a second brochure, announcing the continuation of the program, was distributed in July and August 1969.

Screening and Processing

Four deadlines for submitting proposals were announced during the two years of the COBRE major grant program: November 1, 1968; February 1, 1969; October 1, 1969; and January 15, 1970. As each proposal was received it was assigned to one or more members of the Committee who took primary responsibility for reading it, for suggesting external evaluators, and for making a recommendation for action. After the expiration of each deadline, the full Committee met to discuss the recommendations. Proposals recommended by the full Committee were then transmitted to the Office of Education, which negotiated the grants and monitored them after they had been awarded.

Applications and Grants: Money

In the course of four rounds of proposals, COBRE received and evaluated 360 applications requesting a total of $29,332,385. Of these requests, the Committee recommended 47 for awards, granting a total of $1,990,687 or an average of $43,275* per project. Table 1 shows the amounts requested and

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* This is the amount recommended by COBRE: in a number of cases, minor budget modifications were made by the investigators or by the Office of Education. The total spent by the Office of Education on the basis of recommendations by COBRE was $1,980,625. Not included in this summary is one recommended proposal which was not funded by the OE because it was from a foreign institution, and two that were withdrawn by the investigators because of changes in their research staffs or facilities.

Table 1

Major Grant Program
Funds Requested and Recommended

Deadline	Requested	Granted	N Requests	N Grants
1*	$11,406,427	$ 611,014	131	14
2**	8,159,849	534,172	107	15
3	4,859,798	468,452	63	10
4	4,706,309	377,049	59	7
TOTAL	$29,332,383	$1,990,687	360	46

* Includes two renewals granted after fourth deadline.
** Includes one renewal granted after fourth deadline.

recommended in each award period. As Table 1 shows, the number of requests received and the amount of money requested in the second year were each about half as large as in the first year. Overall, less than ten percent of the funds requested were granted, and only about thirteen percent of the applications were funded at all.

Three requests for continuation of support were also granted; the funds for these are included with the original application in this analysis.

Most of the successful applications were only partially funded. Table 2 shows the average amounts requested by all applicants and by those funded, the average amount granted in each award period, and the average amount cut from the budgets of successful applicants. The funds that were awarded amounted to only a little over half (58 percent) of the funds requested by those applicants. The first year's grants suffered more from budget cuts than those for the second year, although the cuts for the second half of the first year were small (funds requested at that time were also small). The smaller number of applications for the second year perhaps accounted for the larger budgets in the second year's awards, competition being less fierce.

The OE Basic Research Program

The decrease in number of applications in the second year of the Committee's major grant program does not indicate a decrease in interest among researchers, but rather an increase in opportunities for research support from other programs. In late spring of 1969, the Office of Education announced its own unsolicited basic research program with an October 1969 deadline for submission of proposals for the first award period. Although this program was designed to support the same kinds of research as the COBRE program, the two were administered separately. Proposals submitted to one

Table 2

Major Grant Program
Average Funds Requested, Recommended, and Cut for the Four Deadlines

	AVERAGE FUNDS			
Deadline	All Applications	Requested by Those Partially Funded	Granted	Funds Cut
1	$87,072	$105,516	$43,644	$61,827
2	78,129	45,486	35,611	9,875
3	93,013	72,479	46,845	25,633
4	79,768	78,640	53,864	24,776
ALL DEADLINES	$84,496	$ 75,530	$44,991	$30,503

program were not accepted for review by the other. The Office of Education received 149 applications for its October 1969 deadline, which coincided with the third COBRE deadline. Of these, 19 were recommended for funding.

Department Affiliations of Investigators

Table 3 shows the applications and grants recommended by the Committee broken down by the university department or other institution with which the investigators are affiliated. This is only an approximate measure of the actual content of the research proposed, as there were instances in which, for example, people in departments of psychology proposed historical research, or in which anthropologists proposed research on verbal learning. The number of such exceptions was small, however. Psychology (including psychiatry) and education accounted for about half of the applications; social sciences (anthropology, economics, political science, sociology, and history) had a modest share, 16 percent; biology (including all biosciences and medicine) and all other university departments (including computer sciences, speech, engineering, and physical sciences) each had less than 10 percent. Individuals who were not affiliated with a particular university department accounted for about 17 percent of the applications. In most cases, the individuals were from independent, non-profit research organizations; a few were from profit-making organizations, and a few were affiliated with a university or college but not with a particular department within the university or college. The institutions are listed in Appendix 2.

Some information about the applications and grants is summarized in the second half of Table 3. When taken together, psychology and education are represented in about the same proportions among grantees as among applicants. Taken separately, however, departments of psychology are overrepre-

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Table 3

Major Grant Program
Total and Average Funds Requested by
and Granted to Department of Investigator

Department	Total Requested	Average Requested	N Requests	Total Granted	Average Grant	N Grants
Psychology	$ 8,394,193	$79,945	105	$1,079,449	$46,932	23
Education	6,804,344	91,950	74	173,737	57,912	3
Social Science	3,225,815	52,882	61	272,532	27,253	10
Biology	2,753,498	98,339	28	57,200	57,200	1
Other University	1,938,827	69,244	28	123,468	41,156	3
Non-University	6,215,706	97,120	64	284,402	47,400	6
All Departments	$29,332,383	$81,580	360	$1,990,788	$46,309	46

sented (50 percent of grants but only 29 percent of applications) while schools and departments of education are underrepresented (6 percent of grants with 20 percent of applications). Biology is also underrepresented, with the other fields represented among the grantees in approximately the same proportions as among the applicants. Apparently people affiliated with departments of psychology tend to think of their work in terms of basic or fundamental research, while educators do not.

Table 3 also shows the total and average amount requested by and granted to the department of the investigator. Social science research seems to be less expensive than other disciplines, while biology and education are most expensive. All types of investigators experienced budget cuts, but the largest cuts were applied to the non-university research organizations.

Applications and Grants: Visibility of Department

One of the Committee's goals was to interest highly qualified, creative researchers in problems relevant to education. As an approximate measure of the quality of a researcher, one can look at the prestige or visibility of the place where he or she works. (This is on the assumption that highly visible universities or research organizations attract highly qualified researchers and vice versa. The Committee did not use visibility of department as a criterion in awarding grants, but rather attempted to distribute its awards as widely as possible among disciplines and organizations, provided the research proposed was of high quality.) The data in Table 4 are presented as an indirect indication of how successful the Committee was in achieving the goal of attracting the best researchers, and also as an indication of what kinds of places seem to be producing the best

Table 4

Major Grant Program
Number of Applications from and Grants to
"Highly Visible" and other Departments

Department	First Deadline				Second Deadline				Third Deadline				Fourth Deadline			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Psychology	30	19	9	7	37	15	7	5	24	5	5	1	14	1	2	0
Education	39	15	2	2	21	9	0	0	4	2	1	1	10	1	0	0
Social Science	20	10	2	2	15	10	2	2	13	7	3	2	13	6	3	3
Biology	4	2	0	0	8	1	0	0	5	2	0	0	11	4	1	1
Other	15	6	1	1	5	2	1	0	6	2	1	0	2	1	0	0
Non-University	23	X	0	X	21	X	5	X	11	X	0	X	9	X	1	X

Column A: Number of applications
Column B: Number of applications from "highly visible" departments
Column C: Number of grants awarded to all departments
Column D: Number of grants to "highly visible" departments

research in areas relevant to education.

In Table 4, the applications and grants are broken down by the visibility of the department with which the investigator is affiliated.*

The rankings for university departments do not, of course, apply to non-university research organizations.

In Table 4, there are four entries for each of the four deadlines: number of applications, number of applications from "highly visible" departments, number of grants awarded to all departments, and number of grants awarded to "highly visible" departments. In Figures 1 - 7, the same data are presented in graphic form for easier assimilation.

Over the course of the four deadlines, some changes took place. In the first deadline, applications from highly visible departments of psychology dominated, and grants to departments of psychology also dominated. Applications from social sciences, from highly visible social science departments, and grants to social sciences increased, until in the fourth deadline there were more applications from highly visible departments, and more grants in social sciences than in any other field. Education did consistently poorly in grants, although the institutions from which the applications in education came were as visible as in the other fields. Biology showed some indication of an increase in the number of applications from

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* The source for ratings of university departments is a report on The Invisible University: Post-doctoral Education in the United States (National Academy of Sciences, Washington, DC, 1969). In that report, rankings are based on opinions of academics about other departments in their disciplines, and on production of PhD's. Departments ranked "1" or "2" ("distinguished" or "strong") in the NAS report are called "highly visible" here; all others are called "not highly visible." The ranking for departments of social sciences in the NAS report are here applied to departments of psychology and education.

Figure 1

Major Grant Program
Number of Applications from and Grants to "Highly Visible" Departments
(Total Applications = 360; Total Grants = 46)

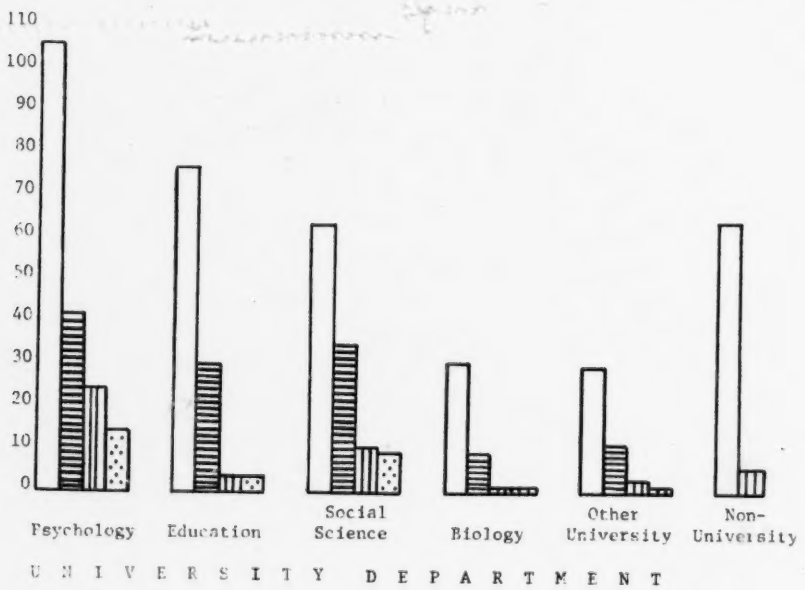


Figure 2 - Psychology

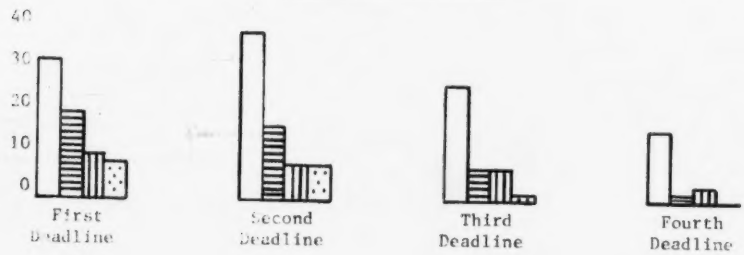


Figure 3 - Education

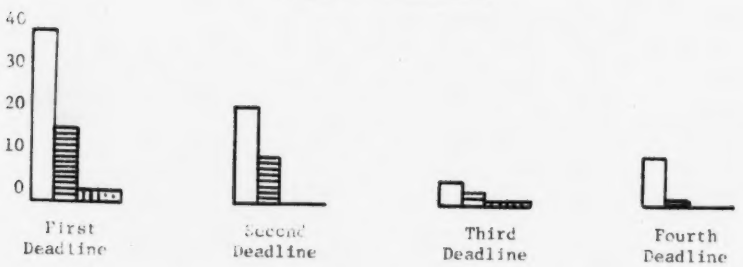


Figure 4 - Social Science

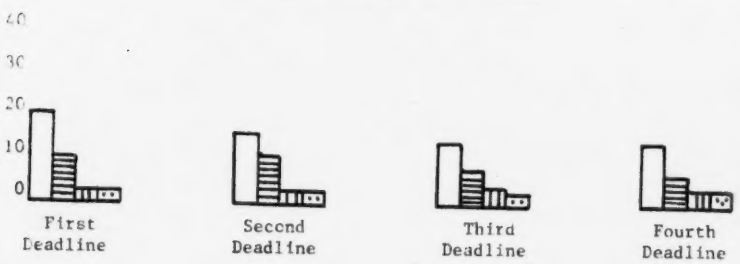


Figure 5 - Biology and Medicine

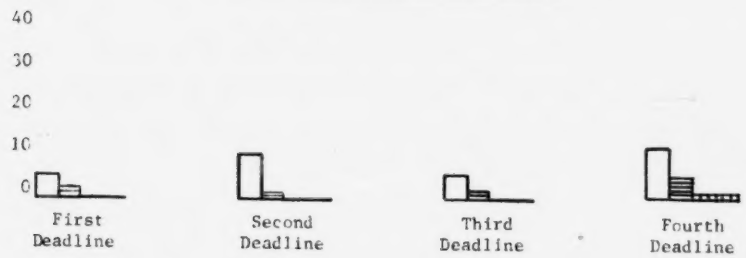


Figure 6 - Other University Departments

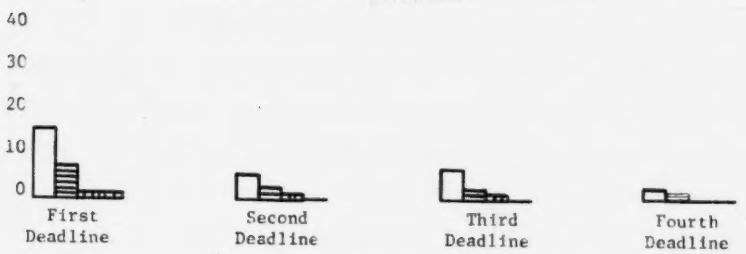
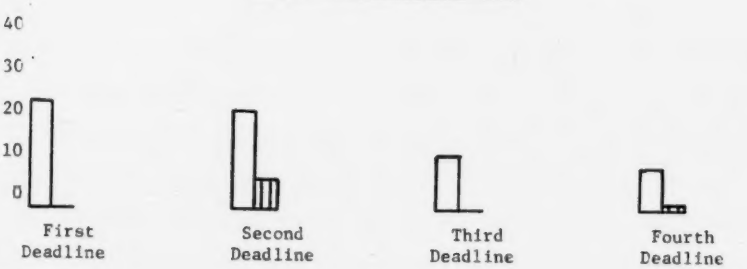


Figure 7 - Non-University



highly visible departments. Although "highly visible" departments are over-represented among grantees, not all grants went to these departments. Certainly there is evidence that researchers in highly visible departments are interested in problems relevant to education, and that interest is increasing particularly in areas other than psychology, where the need for more such work has been greatest.

The titles of the individual projects are listed in Appendix 3, and the content of the projects is discussed in Chapter 3.

Research Workshop Program

At its meeting of September 12-13, 1969, in Charlottesville, the Committee on Basic Research in Education looked back on what it considered to be the beginning of a successful program of major grants. At this meeting the Committee decided to move further toward the development of strategic approaches to basic research in education, including the preparation of guidelines for a coherent, multidisciplinary program of basic research studies and the identification of potential high-quality researchers. To implement this decision, COBRE planned to sponsor a series of eight research workshops.

Each workshop was attended by a small number of participants invited by the workshop director, who was a member of the Committee. The aim of the workshops was to stimulate basic research in the behavioral sciences in areas of potential relevance to education. This was to be accomplished directly by the participants through preparation, discussion, and, in most cases, eventual publication of papers, and indirectly by providing the Committee with the best information available about new and promising directions of inquiry. The issues discussed at the workshops are described in Chapter 3.

Some results of the workshops are incorporated in the final recommendations of the Committee. In addition, most of the workshop directors intend to publish revised versions of some or all of the papers, as indicated in Appendix 4.

In most cases the workshop director was assisted by a coordinator, who was a professional colleague or student. The coordinator helped contact the participants, organize discussion at the workshop, and prepare a report to COBRE on the results. Administrative and financial aspects were handled by the Committee staff. Some of the participants in each workshop served as "consultants." They prepared papers which were duplicated and circulated in advance to all the other participants. Other participants served as discussants, either of specific papers or in a general discussion. Coordinators and consultants were paid for their services; discussants were simply reimbursed for expenses.

In addition to the coordinators, consultants, and discussants, participants at several of the workshops included a representative of the Office of Education, one or more staff members of the National Research Council, and a small number of colleagues or students whom the director invited to attend as observers. More detailed descriptions, lists of participants, and titles of papers appear in Appendix 4.

The Committee spent $115,200 for the eight workshops, an average of $14,400 each.

In chronological order, the workshops were:

(1) Cognitive Organization and Psychological Processes

A. Kimball Romney, Director

August 15-22, 1970

Huntington Beach, California

Fifteen participants, including ten consultants.

(2) Politics of Elementary and Secondary Education

H. Thomas James, Director

September 14-19, 1970

Stanford, California

Twenty-four participants, all of whom were consultants.

(3) Grammar and Semantics of Natural Language

Patrick Suppes, Director

September 17-19, 1970 (Part I) and November 20-21, 1970 (Part II)

Stanford, California

Seventeen participants, all of whom were consultants.

(4) Language Comprehension and the Acquisition of Knowledge

John B. Carroll, Director

March 30, 1971 - April 4, 1971

Rougemont, North Carolina

Fourteen participants, all of whom were consultants.

(5) Sociological Theory and Research in Education

Bruce K. Eckland and James S. Coleman, Directors

May 2-7, 1971

Myrtle Beach, South Carolina

Twenty participants, three of whom were consultants. Ten of the participants were winners of research grants under the COBRE small grant program (described in the next section of this chapter).

(6) Higher Education: Equity and Efficiency

Theodore W. Schultz, Director

June 7-10, 1971

Chicago, Illinois

Twenty-three participants, including nine consultants.

(7) Coding Theory in Learning and Memory

Arthur W. Melton, Director

August 2-8, 1971

Woods Hole, Massachusetts

Fourteen participants, all of whom were consultants.

(8) Genetic Endowment and Environment in the Determination of Behavior

Ernst W. Caspari, Director

October 3-8, 1971

Rye, New York

Twenty-four participants, including ten consultants.

The COBRE Small Grant Program

At its April 1970 meeting, the Committee decided that its work in demonstrating the utility of a major grant program had been completed, but that there was need for a program of "small" grants to encourage younger scholars. This decision was influenced by the fact that as of June 1970 the funds at the Committee's disposal, after making adequate provision for the research workshops, would be limited. The remaining funds, a sum of approximately $500,000, would, however, support approximately 40 grants of $10,000 each, plus an average of $3,000 in indirect costs.

These considerations led to the formulation, the announcement, and

the operation of a small grant program. The distribution of brochures followed the pattern developed for the major grant program, but was intended primarily to attract the attention of recent doctorates in the social and behavioral sciences and education.

To be considered for a grant, an applicant had to have received a doctorate or its equivalent not later than January 1, 1971, and no earlier than January 1, 1965. Since the purpose of the program was to stimulate new research, a formal research proposal was not required for initial screening of applications. Each applicant was asked to submit: (1) a curriculum vita, (2) a copy of a published article or book, or of a manuscript that had been accepted for publication by an edited journal, commercial, or university press, and (3) a two-page statement describing the research proposed, and some indication of what the applicant hoped the research would contribute to education.

The deadline for applications was November 15, 1970.

The Committee relied on four selection criteria: (1) the promise of the applicant as a researcher, (2) the degree to which the proposed research would contribute to scientific knowledge, (3) the potential relevance of the proposed research for education, and (4) the lack of current external research support. In distributing grants among disciplines, the Committee first asked the readers in each discipline to list all the applications in that discipline that were worthy of support. Out of the 443 eligible applications, the Committee selected 77 that were definitely worthy of support. Funds were available to support only about half of these. Forty-one applicants were named as initial recipients of grants, and 37 as alternates. Of the initial 41, 5 received funding from other sources and were, therefore,

judged ineligible for this award; 5 applications from the list of alternates were moved into the category of recipients. A total of 46 applicants were thus offered awards, with 41 accepting and 32 named as runners-up.

The applications, winners, and runners-up are summarized in Table 5 by departmental or institutional affiliation of the principal investigator; the individual grants are listed in Appendix 6.

Upon being notified of their award, the winning applicants were asked to submit a full research proposal, including plan of work, budget, and appropriate institutional signatures. The full proposals were forwarded to the Office of Education, where they were processed for funding.

Comments on the Programs

In terms of its originally proposed goals, the Committee considers its activities highly successful. The Committee's three programs represent three different strategic approaches to basic research support, and each has had its own specific effects.

The major grant program has supported both on-going and new research by established researchers in many areas. It is difficult to judge the consequences of this program now because most of the projects are still in progress. More than half of the researchers involved have already found results significant enough to report in publications or in presentations at professional meetings and conferences.

The small grant program has encouraged 41 very promising young researchers to begin research projects in areas that are relevant to education. The two distinguishing features of this program, restriction to recent PhD's and initial screening on the basis of a brief prospectus, have led to research activity that would not have been supported (or, in

Table 5

Small Grant Program
Applications by and Awards to Department of Investigator*

Department	N Applications	N Awards**	N Runners Up
Psychology	167	20	10
Education	121	8	8
Social Science	85	15	10
Sociology	41	11	6
Economics	12	2	0
Political Science	12	1	1
History	4	0	2
Anthropology	7	1	0
Other	9	0	1
Biology	13	0	0
Other University	43	2	2
Non-University	11	1	2
TOTAL	440	46	32

* All awards were between $10,000 and $13,000 in total costs.

** Includes five who did not receive the award because they obtained funding from another source.

many cases, even proposed) under the major grant program.

The workshops have made use of a variety of approaches depending on the area of focus. In some areas of research, such as those represented by the four workshops on learning, language, and cognitive structure, the workshops brought together a number of researchers working on different approaches to the same problem. This kind of workshop is useful in encouraging communication among members of different academic disciplines, each of whose work is relevant to that of the others. In some areas, such as economics and behavioral genetics, the workshops were designed not only to encourage communication among researchers but to introduce COBRE and the Office of Education to researchers who are doing work that may be highly important to education but who did not seek support from the other program. Finally, in some areas, such as sociology and political science, the workshops were designed to encourage initiation of research and development of theory in disciplines where research on education has not flourished recently.

In several cases, the workshop directors encouraged continuity among the three programs by inviting people whose work was being supported by one of the grant programs to attend a workshop.

Although the programs were, in general, highly successful, members of the Committee feel that there were some ways in which the outcomes could have been improved. Since these vary greatly by field of inquiry, they are discussed with the specific research areas in Chapter 3.

The Committee considered several other mechanisms for supporting basic research, which it did not pursue because of its limitations of time and funding. These include:

- Summer institutes, on rather specific topics of importance

to education, running about six weeks and involving training of researchers as well as reporting on on-going or completed studies.

- Longer-term institutes or centers associated with universities or research organizations.
- Workshops on the model of the eight sponsored by COBRE, but with different kinds of objectives, for example, bringing basic researchers together with people concerned with development and application in education.
- A program of "stimulated" project support, in which researchers are invited to submit proposals on specific topics. The workshops could be one way of identifying the researchers and topics.

Finally, it should be noted that the success of the programs depended in a number of cases on the effort of individual Committee members in publicizing the programs, attracting good proposals, locating appropriate external reviewers, reading proposals, organizing and inviting participants to workshops, etc. The history of the activities of the Committee attests to the importance of having a group of highly qualified researchers intimately involved with any program of support for basic research.

CHAPTER 3

THE ROLE OF THE DISCIPLINES IN BASIC RESEARCH RELATED TO EDUCATION

It is notoriously difficult to draw a precise boundary between "basic" and "applied" research.* The kind of research the Committee considers "basic" presupposes: (1) intellectual continuity, building on and expanding an intellectual background; and (2) exploration of all the aspects of a phenomenon, and of all the interrelationships among these aspects as they develop.

These characteristics make the practical, as opposed to the abstract, definition of basic research fairly simple. Basic research is firmly grounded in the theory and methodology of one or more of the scientific disciplines. The several disciplines, however, vary greatly in the kinds of phenomena they encompass and in the techniques they use.

Since basic research must be seen in the context of the scientific disciplines, COBRE defined as part of its basic mission the exploration in some depth of the role of the various disciplines (singly or in multidisciplinary efforts) in basic research of relevance to education. This section of the report is an attempt to delineate COBRE's experience in all three research support programs with respect to:

(1) Survey of disciplines that appear to have relevance to educational problems, with an indication of the nature of that relevance;

(2) Degree to which COBRE programs were able to attract attention

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* Lee Cronbach and Patrick Suppes, for example, in a report prepared by the Committee on Educational Research of the National Academy of Education, Research for Tomorrow's Schools (The MacMillan Company, 1969), abandon the attempt and distinguish instead between conclusion-oriented and decision-oriented research.

from scholars in the various disciplines and through these to stimulate research;

(3) Scientific quality of the proposals received and funded, and of the final reports of those researchers that were available at the time this report was prepared;

(4) Supply of able investigators in the various fields whose interest in educational problems might be secured; and

(5) Critical areas requiring further study.

Each of a number of disciplines is separately considered.* The ten disciplinary groups (some are more properly subdisciplines or interdisciplinary areas) that the Committee has listed here are the areas it feels at the moment most likely to provide research relevant to education.

Anthropology

Of the proposals funded, only two of the principal investigators listed themselves as anthropologists. One of these (Gumperz) is a linguist and his project is mentioned under linguistics.

One of the more obvious areas in which anthropology might shed light on problems of education is in the area of cultural differences. It is in this area that the one anthropology project was funded (Leacock). Her research center was in Zambia, Africa, where her primary aim was to compare

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* The sections that follow were prepared by individual Committee members. The section on anthropology was prepared by A. Kimball Romney; biology by Ernst W. Caspari; economics by T. W. Schultz; history by Patrick Suppes, with the assistance of Lawrence A. Cremin; linguistics and psycholinguistics by John B. Carroll; philosophy by Patrick Suppes; political science by H. Thomas James; experimental psychology by Arthur W. Melton; educational psychology by Robert M. Gagné; social, organizational, and managerial psychology by Edgar H. Schein; sociology by Bruce K. Eckland; and statistics and measurement by Patrick Suppes.

education in a non-western society with previous work done in New York among low-income groups. Her primary interest was in elucidating the relationship among cultural patterns and the socializing effects of education. A related type of study was funded for work in Africa by a psychologist (Cole). His aim was not the elucidation of cultural factors, but rather the investigation of universal cognitive processes that would remain stable regardless of cultural context. Though Cole's study is primarily psychological, it would be of great interest to anthropologists.

It would seem on the face of it that the mutual relevance of education and anthropology should have stimulated a greater amount of interest in COBRE's activities among anthropologists. The following may have been contributing factors to the relatively low degree of interest:

(1) Of the behavioral scientists, anthropologists are relative newcomers to experimental and quantitative studies;

(2) COBRE's announcing brochure may have appeared to emphasize experimental and quantitative designs; and

(3) Traditional anthropological field work emphasizes a broad approach to society, and this may contribute to a hesitation to specialize on particular instances or areas such as education.

If future basic research programs in education could attract more anthropologists, it should result in mutual benefit.

Biology

The number of proposals listed under "Biology and Medicine" was small and constituted a mixed group. They included the following fields: genetics of behavior, biochemistry and molecular biology of the brain, general biochemistry and drug effects, and neurophysiology. Five of the major proposals

and two small grant applications were funded. Characteristically, only one of the principal investigators is listed as a biochemist, the other four being listed as psychologists. Two are employed by medical institutions, while the remaining three are employed by departments of psychology. It is regrettable that the COBRE program has not been noticed sufficiently by biologists, since, as the projects themselves show, a genetic and biochemical approach has much to contribute to an understanding of educational problems.

An excellent example is the study of Professor Stephen Zamenhof of UCLA on the influence of prenatal starvation on brain development and learning. He found that if female rats are held on a low protein diet before and during pregnancy, the number of nerve cells in the brain is reduced. This reduction in nerve cell number cannot be repaired by better nutrition after birth, and the learning ability of the adults is impaired. In his work supported by the Committee,* Dr. Zamenhof has shown that the reduction of nerve cells is transmitted to the second generation through the mother, but not through the father. The transmission is thus a cytoplasmic and not a genetic effect. Cytoplasmic effects of this type have been described in other cases, though not well studied and understood. This is the first time that such an effect has been shown to affect brain development and behavior. Its bearing on problems of child development and education can hardly be overestimated.

In another study supported by COBRE, one on university professors,

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* Stephen Zamenhof, Edith van Marthens, Ludmila Grauel. "DNA (Cell Number) in Neonatal Brain: Second Generation (F_2) Alteration by Maternal (F_0) Dietary Protein Restriction," Science, 172, 1971, pp. 850-851.

Dr. J. R. P. French, Jr., University of Michigan, again found a substantial positive correlation between an interview measure of achievement orientation (psychological) and the level of uric acid, an end product of nucleic acid metabolism, in the blood (biochemical). As an interpretation of this replicated finding he assumed that the interview measure reflected one aspect of achievement motivation (striving for positive success), but not the other aspect (fear of failure). He hypothesized that: (1) serum uric acid is a cause of striving for success, and (2) this striving leads to actual success as measured by the professor's rate of advancement and number of publications. A story-telling test of striving for success was not related to the interview measure of achievement orientation, and the two hypotheses were not confirmed. Serum uric acid was found to be positively related to number of publications among nontenured professors, but negatively related among tenured professors.

The genetic approach is exemplified by the work of Dr. Richard E. Wimer, City of Hope Medical Center, California, who is studying differences in memory and learning ability in inbred mouse strains, and their interactions with drugs. It is expected that these results will give evidence concerning the neurohumoral factors involved in the strain differences. It will thus elucidate the biochemical-genetic basis of individual differences, and may lead to understanding of the conditions of optimal performance of a specific genotype.

The proposals, and the results which are available (Zamenhof, French), show that a biological approach to educational problems may be fruitful and in some aspects essential.

It is worthwhile to mention that one of the limiting factors in the biological-educational field is the lack of investigators who have command of all the different techniques necessary to do successful research in the field. Dr. French in his final report to OE states: "We fear, however, that this kind of research is beyond the scope of the Institute for Social Research and will have to be carried out by a medical team." But a medical team would probably find the problem raised by Dr. French just as difficult to investigate as the Institute for Social Research. The real lack is in the number of investigators with a sufficiently broad background to attack educational-biological problems. The spectacular success of Dr. Zamenhof's project is an indication that investigators and teams able to carry out this type of research exist and can be developed, and that research in this area will lead to results which are completely unexpected from theory and highly important for the development of effective educational and social policies.

Special note should be taken of the workshop entitled "Genetic Endowment and Environment in the Determination of Behavior" that took place in October 1971 under the direction of Professor Caspari. The workshop consisted of 24 participants including geneticists, psychologists, and other behavioral scientists. Participants focused on the different approaches of geneticists and psychologists to questions of the mutual influences of environment, genetic endowment, and individual behavior.

Economics

COBRE funded three major research and two small grant projects in the economics of education. They are first-rate research enterprises in terms of theoretical and empirical approaches and the high level of competence of the investigators. The problem that each proposes to solve is important in

improving the allocation of resources to education. What is difficult to explain is the fact that there were so few applications in this area in view of the strong development during the last decade in bringing economic analysis to bear on education.

The economics of education has become a vigorous subfield in economics as part of new analytical work in human capital. Professor Blaug's recent annotated bibliography* lists over a thousand items in the economics of education, most of them published since 1960.

The human capital extension of economics is basically of two parts. The "capital" part rests on the proposition that certain types of expenditures create "capacities" that are embodied in man; these capacities in turn are the source of producer services (earnings) and consumer services (satisfactions) over future periods. The other part rests on the allocation of "time" which has led to the economic treatment of a wide array of nonmarket activities. The linkage between the two parts is close and strong. The development associated with human capital revealed the importance of earnings foregone in the formation of human capital. The development of micro theory extending the concept of earnings foregone led to the formulation of the theory of the allocation of time. The main thrust of these developments has been in the formation of human capital by means of education.

The fact that COBRE received relatively few applications for research funds in the economics of education is a puzzle. It is plausible, however, that economists did not become informed with respect to availability of COBRE research funds. It is plausible, despite the efforts that COBRE made to

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* Mark Blaug, Economics of Education: A Selected Annotated Bibliography, 2nd Edition. (London: Pergamon Press, 1970).

announce its program of funding of basic research in education, because economists have not heretofore received any appreciable financial support from the National Research Council or from the two National Academies that jointly sponsored the COBRE funding program. It simply would have required more time to have brought economists into the COBRE fold.

The workshop entitled "Higher Education: Equity and Efficiency," which was held June 7-10, 1971, in Chicago with Theodore W. Schultz as director, has helped to make the Office of Education programs more visible to economists.

Participants in this workshop included prominent economists who are doing research on a question that is of great interest to both economists and policy makers: the effects of higher education and its financing on the distribution of personal income. Dr. Schultz plans to edit the papers for publication as a supplement to the Journal of Political Economy.

History

COBRE acted favorably on four major research proposals and two small grant proposals in the history of education. The six projects were quite diverse in substance and style, ranging from studies of the concept of democratic education in the French Third Republic, using the methods of intellectual history, to studies of the universities of Spain, Italy, England, and the United States during the modern period, using the methods of prosopography, or multiple career-line investigations. And in an interesting way they can be said to reflect a number of the more fruitful recent trends in the historiography of education, for example, the interest in viewing education from the perspective of the client (Bressler's study of student political movements) or of an underclass (Tyack's study of education in northern

black ghettos), the interest in analyzing the manifold relationships between education and social structure (Rothblatt's study of British universities and Stone's study of universities in the west), the interest in tracing the effects of bureaucratization and professionalization on education (Mattingly's study of the origins of professional scholars), and the interest in probing more deeply into the politics of education (Hazlett's study of nineteenth-century French education).

The Committee was less successful than it had hoped in attracting proposals for historical research on education as it proceeds via institutions other than the school, for example, families, churches, libraries, museums, radio and television; or on the ways in which educational ideas and values relate to educational practices in different eras; or on the changing nature and substance of the several fields of knowledge that constitute the curriculum. It was pleased, on the other hand, to have been able to act affirmatively on at least one major study that exemplified both the effort to apply systematic statistical methods to the analysis of educational development and the commitment to comparative inquiry, namely, the Stone project.

Linguistics and Psycholinguistics

Few if any proposals were received, and in any case none were funded, in "pure" linguistics, despite the fact that many types of linguistic studies could be of direct relevance to educational problems--for example, linguistic analyses of the dialects of minority groups, structural analyses of language in relation to the expression and manipulation of logical thought, and studies of the English system of orthography in relation to its sound system. Linguistic scientists have frequently been interested in the application of linguistics to education, but COBRE programs did not attract proposals in

linguistics, possibly because linguistic research has traditionally received relatively generous support from sources other than the basic research programs of the Office of Education.

Nevertheless, the grant programs did attract a considerable number of proposals in the interdisciplinary field of psycholinguistics, and at least one of the investigators (John J. Gumperz) is a well-known research worker in sociolinguistics. Most of the proposals received in psycholinguistics were submitted by psychologists, which might be expected in view of the burgeoning interest in language behavior on the part of psychologists.

Many of the proposals funded dealt with problems of language acquisition and development, either in the young child (see the projects directed by John J. Gumperz, Jacqueline S. Sachs, and J. J. Jenkins) or in later childhood (studies by John B. Carroll). One concerned teachers' attitudes toward the speech characteristics of minority-group children (Frederick D. Williams), and another project attempted to develop more basic information about the nature of language transfer in the case of second language acquisition (Leon A. Jakobovits). One proposal was submitted by a distinguished experimental psychologist (Eleanor J. Gibson) for studies of the processes in the acquisition of reading skills.

While some of these investigators had already received previous support from basic research programs of the Office of Education, recommending their proposals for funding served to signal COBRE's interest and concern for basic studies in psycholinguistics in view of the importance of language in many phases of education. The studies supported by COBRE have high promise of yielding much needed understanding of how children acquire language skills either before reaching school age or during the school years.

Three of the research workshops sponsored by COBRE were relevant to the field of linguistics and psycholinguistics.

The first, "Cognitive Organization and Psychological Processes," was held August 15-22, 1970, at Huntington Beach, California, under the directorship of A. Kimball Romney. Participants in this workshop included anthropologists, psychologists, and linguists who are interested in experimental and mathematical techniques used in the study of natural cognitive structures. The papers presented at this workshop will be published by the National Academy of Sciences in a volume edited by Dr. Romney and Kenneth Wexler.

The second workshop, "Grammar and Semantics of Natural Languages," was conducted in two parts, September 17-19 and November 20-21, 1970, at Stanford University under the direction of Patrick Suppes. Natural language is language as actually used by people. In this case, the focus was on speech of young children. Papers presented included psychological, linguistic, computer science, and philosophical (logical) approaches to the writing of formal descriptions of natural languages. These papers will appear in a volume, Approaches to Natural Language, edited by J. Hintikka, J. Moravcsik, and Patrick Suppes and published by D. Reidel Publishing Company.

The third workshop, "Language Comprehension and the Acquisition of Knowledge," was held March 30 - April 4, 1971, at the Quail Roost Conference Center, Rougemont, North Carolina, under the direction of John B. Carroll. Participants included psychologists and educators who prepared papers presenting theoretical and experimental approaches to the study of sentence and discourse comprehension in laboratory and in actual educational contexts.

Publication of these manuscripts in a book, Language Comprehension and the Acquisition of Knowledge, is planned. It will be edited by Dr. Carroll and Roy O. Freedle and published by V. H. Winston and Sons, Inc.

The Committee believes that these three workshops had a salutary effect in the direction of bringing the attention of anthropologists, philosophers, linguists, and psycholinguists to bear on problems of language development in education.

Philosophy

Only a small number of proposals concerned with philosophy were reviewed, and only one was funded. Its subject matter was not the philosophy of education in the traditional sense, but rather philosophical foundations of the arts and how they should be taught.

Concern with a broad range of problems in the philosophy of education has recently become increasingly important to American philosophers. It is to be hoped that future basic research programs in education will attract more proposals from philosophers.

Political Science

Political scientists showed little interest in the COBRE effort to attract them to the study of education. Thirteen proposals were made to the major grant program; none of them were funded. Subsequently 13 applications for small grants were received from political scientists of which one, a study of politics of bilingual education, was recommended for funding. Three others were listed as worthy of funding, if funds were available.

The reasons for this lack of interest are doubtless complex. Neither political scientists nor pedagogues had yet developed a way of thinking that could provide clear directions for profitable lines of inquiry into the

politics of education. The persistent myth perpetuated by educationists that schools are free of politics, or should be kept so, tends to discourage inquiry. There is little agreement on the proper scope, methods of inquiry, and purposes of study, so that a disorderly array of studies varying greatly in types of units studied, variables analyzed, and levels of generalizations attempted, characterize the field to date. What is needed is a systematic effort, undertaken jointly by political scientists and educators, to sort out some priorities for research and to assess what contributions have been made toward developing a body of theory to guide research and explore some promising directions and methods for extending more systematic inquiry into the interrelationships of politics of education.

A beginning for such an effort came late in COBRE's life with an invitational workshop at Stanford on September 14-19, 1970, directed by H. Thomas James. In retrospect, the support of the several workshops, which sought to assess the state of inquiry into educational problems and opportunities in each discipline, probably should have been the first effort mounted by COBRE. Almost certainly, the Stanford workshop on "Politics of Elementary and Secondary Education," had it been held two years earlier, would have increased the number and quality of proposals made by political scientists, for the workshop marked the beginning of a map for this field of inquiry. A book, State, School and Politics: Research Directions, edited by Michael W. Kirst and published by D. C. Heath, will report the results. The introductory paper by Heinz Eulau is an elegant and insightful exploration of the intersections of political science and education in the long and in the short run.

Three main themes emerged from the workshop and will be elaborated in the forthcoming book. The first relates to the processes by which the aims of education are articulated, aggregated, and shaped into policy for education. The second theme is political socialization, the political education of American youth, with its overtones of civility in discourse, learning to tolerate dissent, learning the processes of social selection and citizenship. The third theme is the governance of public education, dealing with models of decision making, distribution of power, and exploration of research strategies.

The book should provide a useful benchmark from which to begin the serious study of the politics of education. As noted earlier, the wisdom of hindsight leaves one regretful that the workshop could not have preceded the invitation for proposals from political scientists to study educational problems and processes. The Stanford workshop was unquestionably the most important contribution to COBRE's efforts to stimulate political science studies of education, and many of the benefits will extend into the future.

Psychology

Because of the wide diversity of the proposals received and funded in psychology, this section is divided into three subsections: experimental psychology, educational psychology, and social psychology. A section on the psychology of personality is not included since none of the projects supported nor any of the workshops fell clearly within such an area. This is not to say that the psychology of personality would not be a fertile area for research of relevance to education.

There is quite a bit of overlap between research in experimental psychology, educational psychology, and psycholinguistics. Since the Committee

feels this sort of overlap should be encouraged, a broad rather than a narrow definition of these fields has been adopted and several projects are discussed under more than one heading.

Experimental psychology. That part of the science of psychology customarily described as "experimental" psychology is concerned with theory and analytic investigations of basic processes involved in sensory, perceptual, motivational, learning and memory, conceptual, and problem solving and thinking behaviors. Although there was a time when such processes were most frequently studied in subhuman organisms, especially the rat, this is not the case today. Instead, the major "push" within experimental psychology during the later 1950's, and increasingly during the 1960's, has been on understanding such processes in humans, with a growing concern for their developmental changes from infancy to old age. Even more to the point, there has been during the past ten years an almost revolutionary shift in research and theory on information processing functions, especially learning, memory, and cognitive functions, in the direction of greater emphasis on the intellectual skills and strategies that the learner brings to the task and a correlated, lesser emphasis on procedural factors such as repetition and the application of external reinforcement.

It should also be noted that it is in the tradition of contemporary American experimental psychologists to accept "mission orientation" for their basic research efforts. Much of the advancement in knowledge about human perceptual, learning and intellectual skills may be traced to the research accomplished under the sponsorship of the Department of Defense during the 25 years since World War II, with special emphasis on military training and human engineering. In view of this background, it was to be

expected that an offer of support for basic research on these behavioral processes, provided relevance to education could be identified, would be enthusiastically received by experimental psychologists. The extent of their interest is reflected in the predominance of experimental psychologists among the principal investigators for proposals received and among those funded. Even with a rather restrictive definition of "experimental" psychologists, 20 of the 47 principal investigators of funded major grants clearly fall into that category.

COBRE-sponsored work within the domain of experimental psychology reflects the previously noted theoretical trends within the experimental analysis of human learning and cognitive skills, because the state of theory and knowledge within psychology on these matters had obvious implications for the management of learning in preschool and school situations. Since attention (and the skill of ignoring potential distractors) is a first necessary step in learning, four projects (Howard E. Egeth, A. F. Kanarick, Gordon A. Hale, and Eli Saltz) examined various aspects of the control of attention. Analyses of the nature and conditions of study and test as learning variables were examined in studies by Richard C. Atkinson and by Melvin H. Marx. Studies of perceptual development with particular reference to reading skills were conducted by Eleanor J. Gibson. Studies of characteristics of the process involved in coding words at the time of storage in memory were conducted by Delos D. Wickens. Studies of the principles of subjective (i.e., learner) organization of information during learning, and the effects of cognitive skills and strategies on this process were conducted by Charles P. Thompson, Thomas J. Shuell, and Michael Cole, and closely related studies by Joseph Scandura and James G. Greeno looked at these same

factors in concept and rule learning, while Norman H. Anderson, Edward J. Crothers, John B. Carroll, C. H. Fredericksen, and David T. Hakes examined aspects of language comprehension. The point to be made by this listing (although incomplete) is that the research supported by COBRE grants in the area of experimental psychology reflects the major focus of contemporary effort in the experimental psychology of human behavior.

The research supported by COBRE was oriented toward the goal of theoretic and analytic understanding of the processes of learning, remembering, and utilizing what has been learned in thinking and problem solving; not toward "quick fixes" or toward finding simple procedural solutions to the problems of educating individuals. The funded projects have been productive in many ways, but the impact of them on educational technology must be through their contribution to theory and analytic understanding. The support of such work by the Office of Education has increased significantly the level of effort in these areas of experimental psychology that are obviously relevant to the educative process. As with most fundamental scientific efforts, it may be some time before the impact of the COBRE program on the attainment of understanding of these basic behavioral processes may be properly assessed.

In view of the number and quality of the proposals funded in this area, it might be thought that there should be some satisfaction, and even complacency, in COBRE and the Office of Education about having moved basic knowledge ahead. The investigators funded (in the major grant and small grant programs) are readily identifiable as a select group of the older, very well established experimental psychologists and as a select group of the young, very promising experimental psychologists. However, funds were

insufficient for supporting at least once again as many projects of merit from qualified experimental psychologists, and those funded were more often than not reduced in funds per year and in years funded. The net result of this has been that a very large reservoir of talent for the experimental and theoretical analysis of individual behavior processes of importance to educational technology was identified by our appeal for proposals, but most were not rewarded for their effort and interest, and even those who received grants were funded for insufficient time or level of effort to make systematic, programmatic contributions. Further, a number of highly qualified and very productive investigators, supported by the COBRE-OE grants, are not having their work extended by post-COBRE grants from the Office of Education.

It could be that the 1970's will prove to be the golden decade of the experimental and theoretical analysis and understanding of human mental processes--their origin, their development with age and education, and their adult capabilities and limitations. Some workers in the more applied fields, such as education, feel that the academic researcher on human learning is playing games with his permutations and combinations, and that these efforts have little to do with education or learning outside of the laboratory situation. There are, however, a significant number of experimental psychologists who have shed simplistic behavioristic and Gestalt models, and have adopted eclectic approaches. New experimental techniques have been invented with and without the aid of real-time computerized experiments. In addition, the development of techniques of quantitative, theoretical modeling has promise for a more productive understanding of the processes of learning, memory and thinking.

There are this year the first serious signs of unemployment for the

young experimental psychologists who have been trained to carry this effort forward, and there are many more senior psychologists who lack research support. If the Office of Education mounted a major program on the understanding of the intellectual skills of man, for the purpose of applying such knowledge in the management of the educative process, it can be stated with assurance, based on COBRE's experience, that experimental psychologists of the highest caliber, young and old, would form a scientific movement that would make the promise of the 1970's come true, if such is feasible. Without support of such magnitude, the promise may or may not be fulfilled, but it becomes much less likely and/or much more likely to be delayed until the 1980's or later. Meanwhile, good research efforts initiated under the auspices of COBRE are being terminated for lack of funds, many proposals that might have been funded three years ago have not been carried through, and many young theoretical-experimental psychologists dedicated to solving these basic scientific problems are accepting positions in factory-colleges and will soon lose their dedication and their competence. In conclusion, the COBRE effort in experimental psychology was a token effort, more important for determining the strong interest and availability of scientific talent than for the research $1 million can buy. If the lesson learned is not used, a great opportunity will be lost for want of a meaningful program.

In order to focus attention on what is regarded as being one of the most relevant areas of experimental psychology for education, a week-long research workshop on "Coding Theory in Learning and Memory" was held August 2-8, 1971, at Woods Hole, Massachusetts, under the directorship of Arthur W. Melton. Since the field is already fairly advanced and well developed, the format of this workshop consisted of the presentation and discussion of a

number of carefully prepared position papers reporting recent scientific advances. These papers will be published by V. H. Winston and Sons, Inc. during 1972 in a book, Coding Processes in Human Memory, edited by Arthur Melton and Edwin Martin.

Educational psychology. In reviewing research in the field of educational psychology, a definition of this category based upon content rather than organizational affiliation of the principal investigator has been adopted. Frequently, proposals that quite reasonably lie within the field originate from departments of psychology; alternatively, some instances of proposals originating from departments of education are more reasonably classified as "learning psychology," but not necessarily as "educational." Accordingly, the definition of the field, for purposes of this report, was assumed to be as follows: research intending to investigate psychological problems directly related to school learning or related school operations. Using this definition, a proposal concerned with "psychological factors in reading comprehension" is classified as educational psychology, whereas one intending to investigate "information processing in memory" is not so classified. This does not imply, of course, that the latter is unrelated to education; only that it is less likely to be perceived as typical of the field called educational psychology. The number of proposals funded in the major grant program placed in the latter category, in accordance with the definition, was 15.

It is apparent that, within the field of educational psychology, the funded proposals have an obvious and unquestionable relevance to education. Investigators are concerned with studies designed to explore causal factors affecting such concerns of the elementary classroom as impulsive behavior,

the development of selective attention, and the origin of problem-solving behavior. Investigations also deal with conditions of effective learning and retention in such fields as mathematics, reading, language skills, foreign languages, and the understanding and production of art. Somewhat more general studies are undertaken on methods for maximizing the learning process and for the development of learning strategies. It is perhaps not surprising, in view of the psychological nature of these studies, to note some degree of orientation toward the earlier years of education, rather than to the later years. Psychologists prefer to simplify the situations they investigate as much as possible; the high school or college student is indeed a complex organism, when viewed as a learner. Whatever the emphasis so far as age is concerned, however, the high degree of relevance of all these studies to identifiable educational problems is evident.

The funded proposals in the area of educational psychology are characterized by considerable originality and ingenuity. In many instances, they are aimed at the investigation of persistent educational problems, never satisfactorily solved, like those measuring reading comprehension or the ordering of component skills in foreign language instruction. The approaches to such problems are, however, highly original and novel. In this respect, particularly, they deserve to be rated high in scientific quality.

Many of the investigators in this field have outstanding national reputations as productive scientists. At least 6 out of the 15 proposals in this category are from researchers of high status and established reputations. Of the remaining, about half are people whose work is well known and highly respected, while the rest are young but judged as promising by their backgrounds and proposal quality. It is a notable and praiseworthy accomplishment

that the COBRE program has been able to enlist the talent represented by this list of outstanding people.

Social, organizational, and managerial psychology. The proposals received by the Committee in this area were uneven in a number of different respects. It had been hoped that COBRE would stimulate proposals that dealt with the implications of organizational and managerial variables. COBRE did stimulate a few, but the bulk were in the more traditional social psychology areas, especially around issues like the Pygmalion effect (i.e., studies of the ways the level of performance a teacher expects from a pupil affects the actual performance of the pupil, regardless of his ability). A dilemma which the Committee encountered immediately was that the proposals which tackled organizational or managerial questions were either too massive in scope to be supportable by COBRE, or were scientifically too "soft" to risk funds, though in many cases COBRE was perhaps a bit too conservative in its evaluations of such proposals. As a consequence, the Committee tended to support more of the traditional social psychological research where clear-cut experimental designs could be demonstrated by the proposer.

The proposals received were also uneven in their relevance to education. The Committee was successful in attracting some first-rate researchers to apply for funds, but it is difficult to find convincing evidence that COBRE funds stimulated any interest in educational problems or issues that was not already there. It remains to be seen from the final reports and from the future activities of these researchers whether enough interest has been created to induce increased work on educationally relevant research questions. Two proposals stand out as marked exceptions to the conservative trend cited --Fred E. Fiedler's creative and exciting studies of university organization

and productivity, and Donald R. Ploch's study of the socialization process in theological education. These proposals were exciting because they represented work in the area of higher education. The bulk of the proposals still dealt with primary and secondary education.

The proposals received highlighted a further dilemma that reflects the state of the field and which needs to be faced. Many of the most exciting and most educationally relevant research plans did not meet traditional standards for research design. In some cases this failure could be attributed to the investigator's simply not thinking through how to do his project in a scientifically sound way. However, there were other cases, particularly those involving longitudinal studies or measurements of change, where it became clear that we do not now and perhaps never will have research models of the kind some members of the Committee were seeking. We will have to invent new research models, which are appropriate to the more complex problems being investigated, and which meet acceptable standards. Concepts of "action research" are particularly appropriate to studies of complex social systems and organizations, and should be explicitly introduced.

A related dilemma is that good models of educational research probably will increasingly have to be longitudinal. This suggests a different pattern of funding altogether: Why not give an investigator some amount of money to start up a study and contract with him to give him continuation support after some years with no support in between? As an example, one of the Committee members finds that he has panel data on a group of students studied in the early 1960's on a contract that ran out long ago, and now has to start all over again seeking funds to study this group at a point when they are ten years into their career. Similarly, to do organizational or managerial

research may require lower levels of support for longer periods of time before clear-cut findings emerge, yet the proposal writing process militates against the investigator who wants $50,000 in total, spread over five years, and favors the one who asks for the same amount in a single year.

In summary, the social, managerial, and organizational area has had an uneven history within COBRE--there were some excellent proposals and some excellent work is under way, but many dilemmas were uncovered which need to be faced if the Office of Education is to continue to stimulate work in this area.

Sociology

Sociologists submitted 15 proposals to COBRE's major grant programs in 1968-70. Of these 7 were funded, 5 by COBRE and 2 by other agencies. (The reviews for the latter were generally favorable and both probably would otherwise have been recommended for support by COBRE.)

In addition, there were approximately 20 proposals submitted by psychologists, educators, and others which could have been considered essentially sociological in character. This group is not included in the summary below. Only 1 or 2 were funded.

All 15 proposals submitted by sociologists dealt directly with problems in education; 2, however, were considered too "applied" to warrant support. Of those supported by COBRE 3 were concerned with problems in higher education. These included studies of student political movements, the faculty as agents of professional socialization, and the role of student organizations. Two others dealt with patterns of student-student interactions among adolescents, one in terms of a high school social system and the other in terms of the racial composition of classrooms. Another project

dealt with a comparative analysis of education and social mobility.

While all seven of the funded proposals in sociology, including the two receiving outside support, met the Committee's standards for soundness of research design and originality, only one or two were truly outstanding. This may simply be a criticism of the "soft" methods that some sociologists tend to employ.

The eight unfunded proposals generally did not meet the Committee's standards for scientific quality. That is to say, based on the Committee's reviews, it is unlikely that any of the unfunded projects would have been supported even if additional funds had been available. As noted above, two of these were strictly applied projects, having no clear research design.

Considering the small number involved, the safest conclusion is that perhaps one or two of the best research proposals came to the Committee from sociologists, but so did a couple of the worst.

The quality of the major grant program research proposals in sociology was not strongly correlated with the demonstrated competence of the principal investigator. As a matter of fact, of the three proposals submitted by relatively distinguished sociologists, only one was funded. The others that the Committee funded had been written by a group of young and very promising scholars, all of whom were affiliated with a major graduate department of sociology.

Thus, COBRE seems to have had significantly more success in stimulating the interests of younger sociologists and it was from this group that the best proposals came. It should also be noted that, of all proposals received, the proportion coming from sociologists almost doubled between the first and second years of the COBRE program.

Additional signs of optimism come from the small grant program that COBRE initiated in its third and final year. Whereas only 4 percent of the 360 research proposals submitted during the first two years came from sociologists, about 10 percent of the 443 applications to the small grant program for new PhD's were submitted by sociologists. These generally were very promising young scholars, as evidenced by the fact that they won over 20 percent of the awards.

Unlike the privileged status of sociological theory and research in education outside the United States (for example, consider Great Britain and Germany), the field still has an "image problem" in this country owing to its almost total dominance just a generation or so ago by American colleges of education. Consequently, the sociology of education in the U. S. has seldom attracted the best faculty and graduate students from sociology. There is evidence that this is changing and that COBRE perhaps has contributed in some small but important way.

Because of the nature of the field, the format for the research workshop in sociology differed somewhat from those in other fields. This workshop, "Sociological Theory and Research in Education," was held at Myrtle Beach, South Carolina, May 2-7, 1971, under the directorship of Bruce K. Eckland. It was intended expressly for young investigators, most of whom had received COBRE small grant awards. It was not designed to present and discuss formal papers, but rather to assemble appraisals of the "state of the art" and the future development of sociological research in education as seen by a number of consultants. In this way it was hoped that a cadre of young investigators in the sociology of education would be in a better position to develop and carry out research plans of relevance to educational

problems.

Statistics and Measurement

Fundamental research in statistics carried out in the past 50 years has always found considerable application in education, particularly in the construction and analysis of the psychological and educational measurements that are important in diagnosing students' abilities, capacities, dispositions, and achievements, and which play a role in the assessment of educational outputs.

The two funded proposals in statistics were received from well-known, competent investigators and can be characterized as being designed to develop needed special theories in statistics in relation to psychometrics. One of these had to do with optimizing, by Bayesian theory, the arrangement of test items in computer-assisted instruction in order to yield the most efficient measurements. The other was a more general attack on a variety of theoretical and mathematical problems of interest in factor analysis and the theory of educational measurement. Solution of some of these fundamental problems may easily lead to new practical developments in educational testing.

Summary

The Committee on Basic Research in Education finds interesting and important research relevant to education currently being undertaken in all the disciplines examined, although the disciplines also vary greatly as to amount of interest in educational problems and level of theoretical development regarding educational processes. A great deal of important research has been supported, and in many cases directly stimulated, by COBRE programs. The Committee believes, however, that much more important, high quality research could have been supported under these programs had more funds been available.

CHAPTER 4

THE ROLE OF PROBLEM CENTERED INQUIRY IN BASIC EDUCATIONAL RESEARCH

In addition to promising areas of research that can be classified as belonging primarily to one or two disciplines, the Committee discussed a number of areas that are more easily defined in terms of problems. These are problems that the Committee sees as having two characteristics: (1) they are important problems in education today, and (2) basic research can at present usefully be initiated on them.

Several recommendations emerged from the Committee's discussions that should be useful in serving as guidelines for some of the basic research efforts in education over the next decade.

We have organized these general recommendations concerning promising areas of research under six headings. It will be apparent that some of them are more general and already have more structure than others.

1. Organization, Management, and Financing of Schools

The front pages of most newspapers attest to the increasing financial problems that beset school systems in all parts of the country. The financial crises of higher education are also a source of continual concern and form an important item on the agenda of most state legislatures. Over the past decade a number of important studies have been made on the financing of schools, the economics of education, and the social organization of schools, but it is evident that a much deeper understanding of the financial, economic, and social aspects of schools and colleges is needed to serve as an information base for the determination of sound policy. Systematic studies of the management of educational processes, using techniques of management and

organizational psychology as well as economics and sociology, are needed.

Costs and benefits. Perhaps one of the most pressing economic problems is the analysis of how costs may be shifted to match the benefits received by different individuals or social groups. To what extent is there too much a subsidy of higher education by segments of the society not benefiting from that education? How is the tax burden of education related to benefits received? Are new investments in education being allocated in optimal fashion to the appropriate sectors of education? For example, would additional resources be better spent in elementary education or in higher education?

Production functions. If we look at education as an industry, what do we expect as the output of education? Are we satisfied simply to use measures of achievement, and if we do not use such measures, what can serve to provide an output measure? To what extent can the classical theory of the firm be used to derive and analyze production functions for schools and colleges? If the classical theory of the firm and of production functions will not serve this purpose, what are the alternative economic models?

Incentive structure. How can we change the incentive structure for teachers and administrators so that the system can be more responsive to measures of output as, for example, measures of achievement or of mastery learning in the elementary school? Again we are faced with problems of measurement and also problems of social organization. What do we know about the study of social organizations in other parts of the society that provide clues as to how the organization of education can be made more efficient? To what extent can the techniques of labor economists, sociologists, and social psychologists be used to give us deeper insight into the structure

of education as a social organization and methods by which this structure may be changed to make it more efficient?

Technology and capital investment. It has been noted by a number of people that of major industries in the United States, education is the most labor intensive, and there is little evidence that it is becoming less so. Some economists have said that it is the nature of education to be labor intensive and despaired of replacing labor with capital investment. Conversely, for the past decade inflated claims have repeatedly been made about the use of technology in education. Yet the impact of technology is demonstrable at a number of levels of education and for children at different stages of development; perhaps the most impressive evidence is the tremendous impact of television on the knowledge and language of young children. We as yet have a poor understanding of the extent to which technology can be used to make education more efficient, especially to make it less labor intensive. Both economic and psychological studies are needed.

Voucher systems. A number of different groups representing a variety of educational viewpoints have recently advocated the experimental testing of a voucher system for elementary and secondary school education. A variety of systems that approximate voucher systems have been tried in the past. Detailed historical, statistical, and social studies of these past systems would seem to be an urgent prerequisite to the development of any major effort in the immediate future.

2. Learning

The study of learning is perhaps the oldest and most scientifically developed aspect of basic research in education. There is every reason to think that it will continue to occupy a major place in basic educational

research, simply because a continued central focus of education will be the acquisition of knowledge and skills by students.

Early childhood. Emphases on the possibilities for providing intensive educational opportunities to very young children are much discussed in our present society and are beginning to be experimented with on a fairly broad scale. There is much that we still do not know about the learning and maturation of young children. Continued intensive investigation of the cognitive and social development of young children would seem to be an important, indeed essential, prerequisite for any informed policy making in the area of preschool education.

Mastery learning. Recently the idea has come to fore that with sufficient time and effort a high percentage of the population can be brought to a good level of mastery of such basic skills as reading and mathematics. These are the skills that are especially needed for future professional or vocational education. In spite of the great emphasis on the study of reading, we still are ignorant of many important aspects of the reading process. It has been estimated that since 1920 over 30,000 articles and books about reading have been published in the United States. The layman might wonder why there are still fundamental problems to be investigated. Reflection on the complexity and subtlety of the reading process should make it evident that it will be some time before we have anything like an adequate understanding of all the components of the skills required of a competent reader. For example, we are not yet able to build a processing model or theory that even schematically follows through the steps that a reader must go through in looking at the words on a page, perceiving them, decoding them, searching for their meaning or semantics in long-term memory, and finally putting

together the sense or significance of the passage read.

Language acquisition. One reason we do not have a better understanding of the reading process is that there is much that we still do not understand about how a child acquires his first language as a speaker and listener. We have no deep understanding of why it is that every normal child learns to speak and hear a language but learning to read or to use that language in written form is a matter that must be taught in an explicit and detailed fashion. It is reasonable to expect that we shall have no satisfactory theory of reading until we have a satisfactory theory of language acquisition.

Individual differences. We can aim in the society at mastery learning of basic skills by all students, but the existence of individual differences in these skills, especially in the rate of learning them, continues to be one of the most striking and ubiquitous phenomena within the entire domain of school psychology. Yet there is much that we still do not understand about individual differences. We do not understand the extent to which cognitive differences are enhanced or reduced by different school regimes. We have no deep understanding of the extent to which individual differences in children call for different approaches in teaching them.

Acquiring strategies of learning. Recent research in learning theory has increasingly shown that learning a strategy for learning is perhaps the most fundamental aspect of learning a complex sequence of skills or a complex body of knowledge. We are just on the threshold of understanding what it means to learn a learning strategy. Much of the recent work in short- and long-term memory structures should be of direct relevance to understanding how students use learning strategies and how they can be taught to use such strategies better in mastering a given subject matter. There is a growing

consensus among psychologists that the strategy of learning is more critical than the manipulation, management, or presentation of learning materials. It is a matter of understanding how to teach individual methods of learning or strategies of learning. Concentration on these problems can yield important dividends in improving the efficiency of education.

Active learning. There is also an increasing realization that the learner who is active rather than passive is more efficient, but again our understanding of the mechanisms that make an active learner more efficient is as yet very poor. The importance of active responses in learning basic skills has long been recognized, but our understanding of the underlying mechanisms remains unsatisfactory.

Adolescent and adult learning. Aspects of learning such as mastery learning, individual differences, and acquiring strategies for learning are important for adolescents and adults as well as for children. Investigations of learning should be carried out with high school and college students and on adolescents and adults in nonschool training and educational situations. We also need systematic study of ways of applying to adolescents and adults what is already known about learning in children.

3. Participation and Socialization

As was just indicated, classical studies of learning have dominated much educational research. What is needed in the future is greater emphasis on the affective side of all aspects of education, ranging from the motivational structure of students through the role of education in their socialization.

The classroom as a social system. Over the past two decades there have been a number of empirical studies, many of them valuable, of the class-

room behavior of students and teachers, but we continue to lack an integrated theory of classroom behavior and a satisfactory understanding of the social aspects of classrooms as they relate to the learning process.

Efficiency of participation. The desire of students at many age levels to participate more in the decisions about education, ranging from the arrangement of classrooms to the structure of curricula, is widespread, not only in this country but throughout the world. The extent to which this active participation can lead to a more efficient and more successful educational system is scarcely understood at all. There is a general tendency to believe in the virtue of participation. It is perhaps part of the democratic ethic to be in favor of such participation, other things being equal, but there is as yet an unsatisfactory understanding of which modes of participation lead to desirable outcomes and which do not.

Still another sense of participation that needs much more extensive research is the use of group processes and group interaction in learning. We have a very poor understanding of how efficient it is for students to work as teams, especially over an extended period, in learning a subject matter of any complexity and extensiveness. In other words, we as yet have a poor understanding of the interaction between social and learning variables.

Motivation. It is fair to say that historically the number of studies of learning in comparison to the number of studies of motivation in education is at least an order of magnitude greater. There is probably a reasonable case to be made that for students who are not suffering a severe handicap, problems of motivation are most central to their failure, and yet there is still much that is not understood about the reasons for failure. To what extent do peer cultures in schools dominate the motivational structure and

affect positively or negatively a child's interest in and desire to make progress in school? How do incongruities between the child's perception of cultural values in the community and cultural values as presented in the school lead to problems in terms of both the expectations of teachers and of students?

Acquisition of values. Closely related to the topics that have just been discussed is the study of the acquisition of social, political, and individual values by the child and adolescent, and the extent to which the schools channel or direct or have any influence at all on such acquisition. One traditional view has been that a major role of schools is to transmit the values and the culture of the society. Whether or not this does in fact take place, or the extent to which it does, and, if it does, the mechanisms by which such transmission occurs is an important and significant subject for research.

4. Education Outside Schools

The traditional role of the family in the acquisition of values and in the development of processes of socialization has been emphasized and has been the focus of prior research. The special case of television needs more intensive research than it has received. There is good documentation of some of the gross effects of television on the development of children. There is detailed assessment of the effects of particular programs like Sesame Street, but there is little basic understanding of the potential of television and of other technologies for influencing the values, attitudes, and life styles of our future citizens. There are no reasonably clear models or theories as to the limitations of programs like Sesame Street or of their potential in offering alternatives to schools.

5. Educational Myths and History

The history of education is now a lively and burgeoning branch of academic history as studied in universities and other institutions of higher learning, but the creation of educational myths about our past is progressing faster than the study of our past history has been able to document the complex nature of the past. It seems especially important in our rapidly changing times that one focus of research should be a deeper understanding of our own past history and the past role of education in our society. Assessment of the successes and failures of the educational system is needed in other societies and social systems as well as our own. A serious attack on the myths that are held about education because of the inadequate versions of our history that remain uncriticized is needed. A splendid example is much of the curriculum literature of the 1950's and early 1960's that took over unknowingly the assumptions of earlier curriculum movements. The salutary effect of a deeper historical perspective on the cycles of curriculum reform and fashion would be hard to overestimate.

6. Biological Study of Behavior

There are many topics that modern biological tools make available, in a way that has only recently become the case, to genuine research relevant to education.

Genetic basis of individuality. Behavioral genetics has shown that there are differences between individuals, based on their genetic constitution, in their reactions to environmental and experimental conditions. The genotype determines the fundamental biochemical reactions that occur in individual cells. The actual reactions occurring in particular cells depend on developmental and environmental conditions. In other words, the genotype

determines individual differences, and these are expressed as differential reactions to the same learning situation. The educational implication is that it is in principle impossible to find a uniformly optimal method for teaching a particular subject to all children. The extent of genetic variation in learning, and the specificities of individual differences in many, are almost unknown, though methods to investigate them are available.

Environmental conditions. The study of the effects of malnutrition and pollution, for example, on mental functioning have just begun. There is a fair amount of material already on the effects of malnutrition on intellectual functioning, but almost all of the studies deal with extreme cases where malnutrition is clinically obvious. On the other hand, there is undoubtedly a fair number of children with what might be called subthreshold malnutrition. What is needed is some study of the way in which, if at all, such subthreshold malnutrition influences mental functioning and development. In the same way, the same kinds of questions may be asked about pollution. Can deleterious effects of powerful pollutants like mercury be identified? Investigation is needed of what trace amounts of metals and of some chemicals may make a difference in the biological and intellectual development of children. Similar long-term studies of drug usage are needed as well. In experiments of this type, the genetic aspect should not be neglected. It is well known that there are large individual differences in reactions to drugs, and the rapidly developing field of pharmacogenetics investigates the genetic basis of these differences. The same is known to be true for nutritional effects. From these considerations it should be concluded that a program in basic research in education should include not only the psychological, but also the genetic, biochemical, and physiological aspects of the development

of children.

Biology of information transfer. Finally, attention should be called to recent experiments trying to establish that in learning and memory the production of specific macromolecules (specific for a particular learning task) is involved, and that these macromolecules (usually assumed to be RNA) can be transmitted to "naive" animals and increase the rate of acquisition of the specific task. We are just on the verge of getting a fundamental understanding of the mechanisms by which learning takes place at a biological level and the way in which information is stored in memory. Though it is possible that fundamental research in these areas would not have an immediate payoff for education, sufficient progress at a fundamental level could have an overwhelming effect ultimately on the organization of learning and teaching. The experiments are quite contradictory, difficult to interpret, and at the present time, not convincing. If they should turn out to be even partially correct they would open up a completely new possibility of overcoming educational difficulties and problems. Agencies involved in educational policies should follow these developments closely, so that if an opportunity arises it can be exploited without delay.

CHAPTER 5

RECOMMENDATIONS

The Role of Basic Research in Office of Education Programs

The existence of the Committee reflected the assumption that support of basic research by the Office of Education is both necessary and appropriate. The Committee believes that its experience provides strong underpinning for that assumption. The research awards made by and the research workshops conducted under the Committee's auspices are germane to many of the most pressing current problems of education, ranging, as they do, from design of teaching materials and organization of classrooms through financing of school systems to relationships of formal education to other sectors of social activity. The Committee finds that there are many basic researchers who are able and willing to generate knowledge that bears on these important problems. Agency support of basic research, the Committee concludes, helps insure not only that needed research will be performed but also that its results will be accessible to the scientific community and to the Office of Education.

The Committee realizes that basic research may create dilemmas for mission-oriented agencies, simply because it is heavily discipline oriented, its outcome is scientific knowledge and understanding rather than products or "solutions" to problems, and researchers are often unable to predict the outcomes of their work. The Committee also is aware that educational problems are not defined in terms of disciplines, and require that knowledge be translated into products and programs for action.

As an example of such dilemmas, consider the current state of research

in psycholinguistics and experimental psychology, as described in Chapter 3. Research in these areas is being conducted on a number of educationally relevant issues, including that of the effect the organization of a written passage has on the amount and kind of information a student learns from it. This sort of research, however, is due not only to the interest of the researchers in educational problems but even more importantly to recent developments in such disciplines as psychology, linguistics, and even mathematics and computer science, that allow researchers to handle complicated subjects such as comprehending and learning sentences and longer passages. If earlier developments had not provided the necessary foundation, the current research would not be possible, no matter how important the researchers think the issues are.

A contrasting case is political science. In this discipline, foremost researchers, as represented by the participants in the workshop on "Politics of Elementary and Secondary Education," agree that at present political scientists have difficulty making useful scientific statements about the very important issues they are studying because their discipline is first beginning to develop the necessary theoretical foundation.

The Committee has two recommendations in this regard:

(1) *That the Office of Education provide through other programs the mechanisms for carrying the results of basic research through development into application, rather than expect basic researchers to provide the practical applications of their work.* The educational R&D Centers are promising examples of such mechanisms; and

(2) *That the Office of Education provide support to basic researchers who propose to combine basic and developmental research when their basic*

research is deemed to be of high quality.

The Form of Programs for Support of Basic Research

The Committee is pleased to note that the Office of Education has already adopted several programs based on the three COBRE programs and the Committee recommends *that the Office of Education continue to sponsor a program of major grants and a program of small grants in support of basic research and also encourage, through appropriate support, the organization and conduct of research workshops.*

In addition, the Committee recommends *that the Office of Education experiment with programs and procedures that COBRE did not specifically attempt. Among these are summer and longer term institutes; workshops that also include participants who are users of research in addition to producers of basic research; solicited basic research programs; mechanisms for assuring the initiation and continuity of longitudinal research over a period of years; interdisciplinary team research; and grants of a flexible character enabling established, highly competent researchers to pursue promising lines of inquiry without having to state in the research proposal exactly what procedures will be used at all points in the investigation.*

Based on its experience with this and other basic research support programs, the Committee finds that several principles are crucial to the long-term success of a basic research program.

First, because basic research is a process of building on an evolving scientific field, the evaluation and selection of research projects, participants in workshops, etc., must be made by individuals who are intimately familiar with and active in that field. This is important both in attracting good researchers to the programs and in selecting the best from among

the applicants. Thus, the Committee recommends *that the Office of Education insure that the selection of research projects and of participants in research workshops and other similar programs be made by independent peer panels, composed of highly respected researchers in the relevant disciplines.*

The Committee has noted that good basic research is a long-term and somewhat unpredictable endeavor. The timing of programs and the continuity of funding can make a large difference to the productivity of the research being supported. Thus, for major research projects, it is important that deadlines be announced well in advance, while for smaller or pilot projects researchers need to be able to follow a promising lead quickly. In many cases, the same or even a smaller amount of money will permit greater productivity if spread over three or more years than a large grant spent in one or two. Information about the programs must reach researchers well in advance of the deadlines. Therefore, COBRE recommends *that the various research support programs be coordinated so that timing is flexible and continuity of funding is available.*

Support for Basic Research--Content

Chapters 2 and 3 describe in detail the substantive areas of research that the Committee finds most promising to education at present. In summary, COBRE recommends *that the Office of Education support research in the following disciplinary areas: anthropology; biology; economics; history; linguistics and psycholinguistics; philosophy; political science; experimental psychology (especially verbal learning); educational psychology; social, organizational, and managerial psychology; sociology; and statistics and measurement.* The Committee further recommends *that the Office of Education provide support for problem-centered basic research on: organization,*

management and financing of schools (costs and benefits, production functions, incentive structures, technology and capital investment, voucher systems); learning (early childhood, mastery learning, language acquisition, individual differences, acquiring strategies of learning, active learning, and adolescent and adult learning); participation and socialization (the classroom as a social system, efficiency of participation and motivation, and acquisition of values); education outside schools; educational myths and history; and biological study of behavior (genetic basis of individuality, environmental conditions, and biology of information transfer).

DISSEMINATION OF COBRE BROCHURE

July 1969*

SOURCE	APPROXIMATE NUMBER
American Psychological Association (Selected Members)	320
Committee on Sponsored Projects (American Council on Education)	9
National Council of University Research Administrators	414
Lists from Committee Members	170
Office of Scientific Personnel (National Research Council) Lists of Graduate Departments in: Psychology, Sociology, Education, History, Anthropology, Economics, Political Science, Linguistics, Medicine, Business, and Biosciences	1,200
Members of the Division of Behavioral Sciences	220
Associations	13
External Consultants	125
List from Directory of Information Resources in the United States	17
National Training Laboratories Associates	177
National Training Laboratories Fellows	366
Washington Representatives of Higher Education Institutions	19
National Academy of Education	100
Individual Requests	150
	3,300

(Also sent to professional journals with covering letter.)

* Same procedure used for 1968 brochure.

INSTITUTIONS APPLYING FOR SUPPORT UNDER COBRE MAJOR GRANT PROGRAM
(LISTED IN DECREASING ORDER OF NUMBER OF APPLICATIONS
FROM EACH INSTITUTION)

University of Michigan	15
Harvard University	12
University of California at Berkeley	11
University of Wisconsin	8
Educational Testing Service	7
Ohio State University	6
State University of New York at Albany	6
University of California at Irvine	6
University of Chicago	5
Northwestern University	5
Oklahoma State University	5
University of Arizona	5
University of California at Los Angeles	5
University of Connecticut	5
University of Texas at Austin	5
American Institutes for Research	4
Duke University	4
Honeywell Corporation	4
Michigan State University	4
Temple University	4
University of Colorado	4
University of Illinois	4
University of Oregon	4

University of Pennsylvania	4
Cornell University	3
Kansas State University	3
Institute for Behavioral Research	3
Princeton University	3
Purdue University	3
Stanford University	3
State University of New York at Buffalo	3
University of California at Davis	3
University of Kansas	3
University of Massachusetts	3
University of Minnesota	3
University of Missouri at Columbia	3
University of North Carolina	3
University of Southern California	3
University of Tennessee	3
Brigham Young University	2
Carnegie-Mellon University	2
City of Hope Medical Center (California)	2
Florida State University	2
Georgia State University	2
Haskins Laboratories	2
HumRRO (George Washington University)	2
Indiana University	2
Iowa State University	2
Johns Hopkins University	2

Kenney Rehabilitation Institute	2
Lehigh University	2
Massachusetts Institute of Technology	2
Mankato State College	2
New York University	2
Oregon State System of Higher Education	2
Rutgers University	2
State University of New York at Stony Brook	2
University of Cincinnati	2
University of California at Santa Barbara	2
University of Georgia	2
University of Kentucky	2
University of Michigan Medical School	2
University of New Mexico	2
University of Northern Iowa	2
University of South Florida	2
University of Texas at El Paso	2
University of Utah	2
University of Washington	2
University of Virginia	2
Urbdata Associates, Inc.	2
William Alanson White Institute	2
Wichita State University	2
Wisconsin State University	2
Abt Associates	1
Adelphi University	1

Albert Einstein College of Medicine	1
American University	1
American College Testing Program	1
American Council on Education	1
Auburn University	1
Baltimore City Hospitals	1
Bolt, Beranek and Newman	1
Boston College	1
Brandeis University	1
California State College	1
Center for Community Research (New York City)	1
Clark University	1
College of Notre Dame	1
Colorado State University	1
Columbia University	1
Community Consolidated School District #59 (Illinois)	1
Computer Graphics, Inc.	1
Cornell College	1
Data for Decision Making	1
Drake University	1
Duquesne University	1
Emory University	1
Fordham University	1
General Programmed Teaching	1
Georgetown University	1
Georgia Institute of Technology	1

Hunter College	1
Illinois State University	1
InfoSci., Inc.	1
Institute for Behavioral Research in Creativity	1
Institute for Community Studies	1
Johns Hopkins Medical School	1
Kelly Scientific Corporation	1
Lake Forest College	1
Language Research Foundation	1
Lansing School District (Michigan)	1
LeMoyne College	1
London School of Economics	1
Macalester College	1
Merrill-Palmer Institute	1
Massachusetts General Hospital	1
Memphis State University	1
Miami University	1
Montgomery County Public Schools (Pennsylvania)	1
Nankin Mills School District	1
National Bureau of Economic Research	1
Naval Postgraduate School	1
New Mexico State University	1
New York Medical College	1
New School for Social Research	1
North Carolina State University	1
Oakland University	1

Pennsylvania State University	1
Polytechnic Institute of Brooklyn	1
Rensselaer Polytechnic Institute	1
Sacramento State College	1
Salk Institute	1
Science Education Systems	1
Scientific Educational Systems	1
Self-employed	1
Southern College of Optometry	1
Southern University	1
Southern Illinois University	1
State University of New York College at Pottsdam	1
State University of Iowa	1
Stirling School, Hamden, Connecticut	1
Stout State University	1
Teachers College, Columbia University	1
Ulster County Community College	1
University of Arkansas	1
University of California at San Diego	1
University of California at Santa Cruz	1
University of Hartford	1
University of Iowa	1
University of Hawaii	1
University of Mississippi	1
University of Missouri at Kansas City	1
University of Nebraska	1

University of Nevada	1
University of New Hampshire	1
University of Pittsburgh	1
University of Rochester	1
University of Wisconsin at Milwaukee	1
University of Wyoming	1
Utah State University	1
Vanderbilt University	1
Virginia Commonwealth Medical School	1
Virginia Polytechnic Institute	1
Wake Forest College	1
Washington State University	1
Wayne State University	1
Worcester State Hospital	1
Yale University	1
Zaret Foundation	1

COMMITTEE ON BASIC RESEARCH IN EDUCATION

MAJOR GRANT PROGRAM

APPROVED PROPOSALS

1968 - 1969

Number	Proposer	Title	Organization	Title	Duration
DBS-0101	Delos D. Wickens	Professor, Psychology	Ohio State University	Response Class in Learning and Memory	3/1/69-2/28/71
DBS-0114	Richard C. Atkinson	Professor, Psychology	Stanford University	Methods for Maximizing the Learning Process	5/1/69-4/30/71
DBS-0118	Marvin Bressler	Professor, Sociology	Princeton University	Student Political Movements in the United States During the First Six Decades of the Twentieth Century	6/1/69-5/31/70
DBS-0129	Joseph Scandura	Associate Professor, Education	University of Pennsylvania	Mathematics and Structural Learning	6/1/69-5/31/70
DBS-0133	Philip F. Bonacich	Assistant Professor, Sociology	U.C.L.A.	Overlapping Groups in High Schools	3/1/69-2/28/70
DBS-0137	Edmund B. Coleman	Graduate Dean	University of Texas	Collecting a Data Base for a Reading Technology	6/1/69-5/31/70
DBS-0185	James G. Greeno	Associate Professor, Psychology	University of Michigan	Development of a Theory of Cognitive Structures and Their Role in Simple Problem Solving	6/1/69-5/31/71
DBS-0191	John R. P. French	Professor, Psychology	University of Michigan	Serum Urate Concentration, Achievement Motivation, and Educational Attainment	5/1/69-10/31/70
DBS-0202	Eleanor J. Gibson	Professor, Psychology	Cornell University	Studies in Perceptual Development and the Acquisition of Reading Skills	6/1/69-5/31/71
DBS-0205	John J. Gumperz	Professor, Anthropology	Berkeley	Studies in the Acquisition of Communication Competence	3/1/69-2/28/70

Number	Proposer	Title	Organization	Title	Duration
DBS-0213	Nelson Goodman	Professor, Philosophy	Harvard University	Basic Abilities Required for Understanding and Creation in the Arts	6/15/69-5/14/70
DBS-0218	Howard E. Egeth	Assistant Professor, Psychology	Johns Hopkins University	Attending and Ignoring	3/1/69-2/28/71
DBS-0224	Edward J. Crothers	Associate Professor, Psychology	University of Colorado	Paragraph Structure and Paragraph Comprehension	6/1/69-5/31/71
DBS-0237	Gregory A. Kimble	Chairman, Psychology	University of Colorado	The Effects of Motivation on Retention	3/1/69-8/31/70
DBS-0302	Mark R. Rosenzweig	Professor, Psychology	University of California, Berkeley	Drug-Environmental Effects on Brain and Behavior in Rodents	6/1/69-5/31/71
DBS-0303	Norman H. Anderson	Professor, Psychology	University of California, San Diego	Mathematical Analysis of Information Integration with Paragraph-Type Verbal Stimuli	6/1/69-5/31/70
DBS-0313	Sheldon Rothblatt	Assistant Professor, History	University of California, Berkeley	Studies in the Social and Cultural History of British Universities	6/1/69-8/1/70
DBS-0316	Melvin H. Marx	Research Professor, Psychology	University of Missouri	Decision Making and Observation Variables in Acquisition, Retention, and Transfer	6/1/69-5/31/70
DBS-0325	Jacqueline S. Sachs	Assistant Professor, Speech	University of Connecticut	The Ontogeny of Language Learning Abilities	6/1/69-5/31/71
DBS-0328	John B. Carroll	Senior Research Psychologist	Educational Testing Service	School Age Children's Comprehension of Words with Multiple Grammatical Functions	6/1/69-5/31/70

Number	Proposer	Title	Organization	Title	Duration
DBS-0346	A. F. Kanarick	Research Scientist, Psychology	Honeywell	Eye Fixation Recordings During Information Acquisition in Short Term Memory	6/1/69-5/31/70
DBS-0353	M. R. Novick	Research Statistician	Educational Testing Service	Bayesian Methods for Computer-Assisted Testing	6/1/69-5/31/71
DBS-0355	J. J. Jenkins	Professor, Psychology	University of Minnesota	Discrimination of Speech Sounds as a Function of Age, Native Language and Instruction	6/1/69-5/31/71
DBS-0358	C. H. Frederiksen	Assistant Professor, Psychology	University of California, Berkeley	Cognitive Aspects of Learning in Arbitrary and Non-Arbitrary Contexts	6/1/69-5/31/71
DBS-0367	Richard E. Wimer	Chief, Behavior Section	City of Hope Medical Center, Duarte, California	Individual Differences in Learning and Memory	6/1/69-5/31/70
DBS-0368	D. O. Sears	Associate Professor, Psychology	U.C.L.A.	Childhood Socialization of Concepts of Political Conflict and Power	6/1/69-5/31/70
DBS-0373	G. A. Hale	Research Psychologist	Educational Testing Service	Studies in Selective Attention in Children	6/1/69-5/31/70
DBS-0398	James A. Wiggins	Assistant Professor, Sociology	University of North Carolina	Education Achievement Project: Racial Composition, Classroom Reward Structure, and Educational Outcomes Among Negro Students	9/1/69-8/31/70

Number	Proposer	Title	Organization	Title	Duration
DBS-0400	Leon A. Jakobovits	Associate Professor, Psychology	University of Illinois	Transfer Effects in Second Language Learning	6/15/70-6/14/72
DBS-0507	Irma Adelman	Professor, Economics	Northwestern University	Optimal Allocation of Resources in Urban Education	2/1/70-4/30/71
DBS-0511	Donald R. Ploch	Assistant Professor, Sociology	Yale University	Theology Education: The Faculty as Agents of Professionalization and Change	2/1/70-1/31/71
DBS-0513	Charles P. Thompson	Associate Professor, Psychology	Kansas State University	Category Characteristics and Free Recall	6/1/70-5/31/72
DBS-0516	Frederick D. Williams	Professor and Director, Center for Communications Research	University of Texas, Austin	Attitudinal Correlates of Children's Speech Characteristics	2/1/70-1/31/71
DBS-0520	David T. Hakes	Associate Professor, Psychology	University of Texas, Austin	Psychological Processes Involved in Comprehending Sentences	6/1/70-5/31/72
DBS-0523	William A. Johnston	Associate Professor, Psychology	University of Utah	Information Processing in Memory Tasks	6/15/70-6/14/72
DBS-0525	Eleanor B. Leacock	Professor, Anthropology	Polytechnic Institute of Brooklyn	Cross Cultural Study of Educational Motivation and Performance	6/1/70-5/31/71
DBS-0526	Fred E. Fiedler	Professor, Psychology	University of Washington	Organizational Factors Influencing the Performance of Educational Institutions	2/1/70-1/31/72

Number	Proposer	Title	Organization	Title	Duration
DBS-0533	Henry F. Kaiser	Professor, Education	University of California, Berkeley	Research in Educational and and Psychological Measurement	6/1/70-5/31/72
DBS-0537	Thomas J. Shuell	Assistant Professor, Psychology	State University of New York, Buffalo	Individual Differences in Learning and Retention	2/1/70-7/31/71
DBS-0546	F. Thomas Juster	Vice President	National Bureau of Economic Research	A Study of Production Functions in Education	6/1/70-5/31/71
DBS-0600	Stephen Samenhoff	Professor, Microbial Genetics	University of California Medical School	Study of the Influence of Prenatal Nutrition on Brain Development and Learning	6/1/70-5/31/72
* DBS-0613	Lawrence Stone	Director, S. C. Davis Center for Historical Studies	Princeton University	A Statistical Survey of Universities in the West	7/1/70-6/30/72
DBS-0620	Zelda F. Gamson	Study Director, Survey Research Center	University of Michigan	Relations Between Student Organizations and the Wider University	7/1/70-6/30/72
DBS-0632	Miriam Cohen	Medical Research Associate, Psychiatry	Baltimore City Hospitals	The Use of Operant Techniques to Teach Problem Solving Behavior	6/1/70-5/31/71
* DBS-0646	Michael Cole	Professor, Psychology	Rockefeller University	Cultural Variations in the Development of Learning Strategies	7/1/70-6/30/72

Number	Proposer	Title	Organization	Title	Duration
DBS-0647	Gordon A. Hale	Research Psychologist	Educational Testing Service	Studies in Selective Attention in Children	6/1/70-5/31/71
* DBS-0648	Eli Saltz	Professor, Psychology	Wayne State University	Verbal Control and Impulsive Behavior in the Classroom	7/1/70-6/30/72
DBS-0654	David B. Tyack	Associate Professor, History and Education	Stanford University	Historical Analysis of Education in Northern Black Ghettos	9/1/70-8/31/72
* DBS-0660	Edmund B. Coleman	Professor, Psychology	University of Texas, El Paso	Collecting a Data Base for a Reading Technology	9/1/70-8/31/71
DBS-0661	Nelson Goodman	Professor, Philosophy	Harvard University	Basic Abilities Required for Understanding and Creation in the Arts	6/15/70-9/14/71

* These projects are caught in the "freeze" on new starts and have not yet been funded.

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* Paper
** Joint Paper

RESEARCH WORKSHOP ON
COGNITIVE ORGANIZATION AND PSYCHOLOGICAL PROCESSES
HUNTINGTON BEACH, CALIFORNIA
August 15-22, 1970

1. BURTON, Michael. "The Use of the Balanced Block Design for the Triads Test of Judged Similarity" (with Nerlove)
2. CLARK, Herbert. "How We Understand Negation"
3. CROTHERS, Edward J. "The Psycholinguistic Structure of Knowledge: 1. Some Examples"
4. D'ANDRADE, Roy G. "Cognitive Structures and Judgment"
5. GEOGHEGAN, William. "A Theory of Marking Rules"
6. GREENO, James. "Utilization of Cognitive Structures in Problem Solving and Reasoning"
7. KINTSCH, Walter. "Semantic Structure and Clustering in Free Recall"
8. NERLOVE, Sally. "The Use of the Balanced Block Design for the Triads Test of Judged Similarity" (with Burton)
9. RUMELHART, David. "Toward a Thecry of Analogical Reasoning"
10. WEXLER, Kenneth. "Semantic Structure: Psychological Evidence for Hierarchical Features"

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National Academy of Sciences/National Research Council Staff

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Mrs. Carole W. Parsons, Staff Associate
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* Paper

RESEARCH WORKSHOP ON
THE POLITICS OF ELEMENTARY AND SECONDARY EDUCATION
STANFORD UNIVERSITY
September 14-19, 1970

1. BAILEY, Stephen K. "Education and the Pursuit of Happiness"
2. BERKE, Joel S. "A Proposed Study of Educational Policy Impact"
3. CRECINE, J. Patrick. "The Politics of Education--Some Thoughts on Research Directions"
4. ELAZAR, Daniel J. "The Relationship of the School to the Movement for Community Control"
5. EULAU, Heinz. "Political Science and Education: The Long View and the Short"
6. GIDEONSE, Hendrik. "Some Ideas for Research in the Politics of Science for Education"
7. GREENBERG, Edward S. "The Civic Miseducation of American Youth: Political Science and Paradigm Change"
8. HESS, Robert D. "Th[illegible]ghts in memo to workshop coordinator"
9. IANNACCONE, Lawren[illegible]. "Research Priorities in the Politics of Education"
10. JACOB, Herbert. "Feedback from Changes in the Educational System"
11. LA NOUE, George R. "The Concept of Accountability: A Research Priority in the Politics of Education Field"
12. LIPSKY, Michael. "On Studying the Politics of Education"
13. LITT, Edgar. "Sustaining Public Commitment Among the Young: Experimental Political Learning"
14. LONG, Norton E. "Community, Neighborhood and Educational Performance"
15. MEYER, John W. "Comparative Research on the Relationships between Political and Educational Institutions"
16. PETERSON, Paul E. "Models of Decision-Making"

17. PREWITT, Kenneth. 'Social Selection and Social Citizenship"

18. SALISBURY, Robert H. "If I Had My 'druthers'"

19. SHARKANSKY, Ira. "Within-State Distributions of Educational Spending: A Coincidental Examination of State-Wide and Sub-State Data"

20. WEILER, Hans N. "Learning to Tolerate Dissent: Political Socialization, Education and the Meaning of Conflict"

21. WIRT, Frederick M. "American Schools as a Political System"

22. WOLIN, Sheldon S. "Politics, Education, and Theory"

23. ZEIGLER, Harmon L., Jr. "Proposed Research Project"

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RESEARCH WORKSHOP ON
GRAMMAR AND SEMANTICS OF NATURAL LANGUAGE

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* Paper
** Joint Paper
Joint Paper

RESEARCH WORKSHOP ON
GRAMMAR AND SEMANTICS OF NATURAL LANGUAGE
STANFORD UNIVERSITY
September 17-19, 1970
and
November 20-21, 1970

1. BRESNAN, Joan. "On Sentence Stress and Syntactic Transformations"

2. CHENG, Chung-ying. "On the Problem of Subject Structure in Language with Application to Late Archaic Chinese"

3. CHENG, Teresa M. W. "A Proposal Concerning Question-words"

4. DOLAN, John M. "Translation, Rationality, and Complexity"

5. FRIEDMAN, Joyce. "Computing and Case Grammar"

6. GAMMON, Elizabeth. "A Syntactic Analysis of Some First-Grade Readers"

7. HAMBURGER, Henry. "On the Insufficiency of Surface Data for the Learning of Transformational Languages" (with Wexler)

8. HINTIKKA, Jaakko. "Grammar and Logic: Some Borderline Problems"

9. KAPLAN, David. "DTHAT"

10. KNUTH, Donald. "Examples of Formal Semantics"

11. MONTAGUE, Richard. "The Proper Treatment of Quantification in Ordinary English"

12. MORAVCSIK, Julius. "The Problem of the Semantics of Mass Terms in English"

13. MOSKOWITZ, Arlene. "The Concept of Unit in Child Grammar"

14. PARTEE, Barbara Hall. "Intensional Isomorphism and Deep Structure"

15. PETERS, Stanley. "On Restricting the Base Component of Transformational Grammars" (with Ritchie)

16. RITCHIE, R. W. "On Restricting the Base Component of Transformational Grammars" (with Peters)

17. SUPPES, Patrick. "Semantics of Context-Free Fragments of Natural Languages"

18. WATT, W. C. "Late Lexicalizations"

19. WEXLER, Kenneth. "On the Insufficiency of Surface Data for the Learning of Transformational Languages" (with Hamburger)

PARTICIPANTS

RESEARCH WORKSHOP ON
LANGUAGE COMPREHENSION AND THE ACQUISITION OF KNOWLEDGE

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* Paper
** Joint Paper

RESEARCH WORKSHOP ON
LANGUAGE COMPREHENSION AND THE ACQUISITION OF KNOWLEDGE
ROUGEMONT, NORTH CAROLINA
March 30 to April 4, 1971

1. CARROLL, John. "Defining Language Comprehension: Some Speculations"
2. CHAFE, Wallace. "Discourse Structure and Human Knowledge"
3. COLEMAN, Edmund. "Engineering Comprehension with Reading Instruction"
4. CROTHERS, Edward. "Memory Structure and the Recall of Discourse"
5. FRASE, Lawrence. "Maintenance and Control in the Acquisition of Knowledge from Written Materials"
6. FREDERIKSEN, Carl. "Effects of Task-Induced Cognitive Operations on Comprehension and Memory Processes"
7. FREEDLE, Roy. "Language Users as Fallible Information-Processors: Implications for Measuring and Modeling Comprehension"
8. GOODMAN, Kenneth. "Reading: Meaning Construction or Reconstruction" (with Page)
9. HERRIOT, Peter and LUNZER, E. A. "Comprehension and Cognitive Development"
10. OLSON, David. "Language Use for Communication, Instruction, and Thinking"
11. PAGE, William. "Reading: Meaning Construction or Reconstruction" (with Goodman)
12. ROTHKOPF, Ernst. "Structural Text Features and the Control of Processes in Learning from Written Materials"
13. SCRIVEN, Michael. "The Concept of Comprehension: From Semantics to Software"
14. SIMMONS, Robert. "Some Semantic Structures for Representing English Meanings"
15. STICHT, Thomas. "Factors Affecting Learning by Listening"
16. TRABASSO, Thomas. "Mental Operations in Language Comprehension"

PARTICIPANTS

RESEARCH WORKSHOP ON
SOCIOLOGICAL THEORY AND RESEARCH IN EDUCATION

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* Paper

RESEARCH WORKSHOP ON
SOCIOLOGICAL THEORY AND RESEARCH IN EDUCATION
MYRTLE BEACH, SOUTH CAROLINA
May 2-7, 1971

1. ANDERSON, C. Arnold. "Salient Themes in Theory and Research on the Sociology of Education"

2. CORWIN, Ronald G. "On the Significance of Educational Organizations"

3. ELDER, Glen H. "Socialization and Personality in Education: A View from Social Psychology"

PARTICIPANTS

RESEARCH WORKSHOP ON
HIGHER EDUCATION: EQUITY AND EFFICIENCY

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\# Joint Paper

RESEARCH WORKSHOP ON
HIGHER EDUCATION: EQUITY AND EFFICIENCY
CHICAGO, ILLINOIS
June 7-10, 1971

1. BOWLES, Samuel. "Schooling and Inequality from Generation to Generation"

2. CHISWICK, Barry, and MINCER, Jacob. "Changes in Schooling, Age and Earnings Since 1939 and Effects Upon the Distribution of Personal Income"

3. GRILICHES, Zvi. "Education, Income and Ability"

4. HANSEN, W. Lee. "Proposals for Financing Higher Education and Their Implications with Respect to Equity"

5. HARTMAN, Robert. "Distributional Effects of Various Methods of Financing Higher Education" (with Pechman)

6. HAUSE, John. "Ability and Schooling as Determinants of Lifetime Earnings"

7. JOHNSON, Harry G. "The Alternatives Before Us"

8. PECHMAN, Joseph. "Distributional Effects of Various Methods of Financing Higher Education" (with Hartman)

9. SCHULTZ, Theodore W. "Optimal Investment in College Instruction: The Efficiency-Equity Quandary"

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RESEARCH WORKSHOP ON
CODING THEORY IN LEARNING AND MEMORY

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RESEARCH WORKSHOP ON
CODING THEORY IN LEARNING AND MEMORY
WOODS HOLE, MASSACHUSETTS
August 2-8, 1971

1. ATTNEAVE, Fred. "The Representation of Physical Space"
2. BJORK, Robert A. "The Power of Positive Forgetting: A Theoretical Review of Cueing-To-Forget Research"
3. BOWER, Gordon H. "Stimulus-Sampling Theory of Encoding Variability"
4. ESTES, W. K. "An Associative Basis for Stimulus Coding"
5. GARNER, Wendell R. "Information Integration and Form of Encoding"
6. HUNT, Earl. "The Memory We Must Have"
7. JOHNSON, Neal F. "Organization and the Concept of a Memory Code"
8. LIBERMAN, Alvin M., MATTINGLEY, Ignatius G., and TURVEY, Michael T. "Language Codes and Memory Codes"
9. MARTIN, Edwin. "Stimulus Encoding in Learning and Transfer"
10. MILLER, George A. "English Verbs of Motion: A Case Study in Semantics and Lexical Memory"
11. NEWELL, Allen. "On Mechanisms for Coding the Stimulus: Preliminary Pass"
12. POSNER, Michael I., and WARREN, Robert E. "Traces, Concepts and Conscious Constructions"
13. RICHARDSON, Jack. "Encoding and Stimulus Selection in Paired-Associate Verbal Learning"
14. UNDERWOOD, Benton J. "Are We Overloading Memory"
15. WICKENS, Delos D. "On Selective Emphasis of Alternative Encoding Features"

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* Paper
** Joint Paper
Joint Paper

RESEARCH WORKSHOP ON
GENETIC ENDOWMENT AND ENVIRONMENT IN
THE DETERMINATION OF BEHAVIOR
RYE, NEW YORK
October 3-8, 1971

1. DE FRIES, J. C. "Quantitative Aspects of Genetics and Environment in the Determination of Behavior"

2. ERLENMEYER-KIMLING, L. "Gene-Environment Interactions and the Variability of Behavior"

3. GOTTESMAN, I. I. "Human Behavioral Adaptations--Speculations on their Genesis" (with Heston)

4. HESTON, L. L. "Human Behavioral Adaptations--Speculations on their Genesis" (with Gottesman)

5. MC CLEARN, Gerald E. "Genetic Determination of Behavior (Animal)"

6. MORTON, N. E. "Human Behavioral Genetics"

7. MOTULSKY, Arno G. "Biochemical Genetics and the Evolution of Human Behavior" (with Omenn)

8. OMENN, Gilbert S. "Biochemical Genetics and the Evolution of Human Behavior" (with Motulsky)

9. PARSONS, P. A. "Genetic Determination of Behavior (Mice and Men)"

10. PETIT, Claudine. "Qualitative Aspects of Genetics and Environment in the Determination of Behavior"

11. TOBACH, Ethel. "The Meaning of Cryptohomunculus"

12. VANDENBERG, S. C. "The Future of Human Behavior Genetics"

WORKSHOP ON GENETIC ENDOWMENT AND ENVIRONMENT IN THE DETERMINATION OF BEHAVIOR

October 3-8, 1971

Ernst Caspari - Director
Lee Ehrman - Coordinator

Day I	Quantitative aspects of genetics and environment in the determination of behavior	
	Consultant: J. DeFries	Discussant: J. Fuller
	Qualitative aspects of genetics and environment in the determination of behavior	
	Consultant: C. Petit	Discussant: A. Manning
Day II	Genetic determination of behavior (animal)	
	Consultant: G. McClearn	Discussant: S. Prakash
	Genetic determination of behavior (human)	
	Consultant: P. Parsons	Discussant: L. Heston
Day III	Relationship between behavior and evolution	
	Consultant: I. Gottesman	Discussant: W. Pollitzer
	Consultant: Motulsky & Omenn	Discussant: E. Anderson
Day IV	Gene-environment interaction in determining behavior	
	Consultant: L. Erlenmeyer-Kimling	Discussant: W. Thompson
	Consultant: E. Tobach	Discussant: A. Jensen
Day V	Methodology in the analysis of human behavior genetics	
	Consultant: N. Morton	Discussant: P. Workman
	Consultant: S. Vandenberg	Discussant: B. Ginsburg

INSTITUTIONS APPLYING FOR SUPPORT UNDER COBRE SMALL GRANT PROGRAM
(LISTED IN DECREASING ORDER OF NUMBER OF APPLICATIONS
FROM EACH INSTITUTION)

Temple University	18
University of Wisconsin at Madison	17
Southern Illinois University	13
University of Texas at Austin	13
Harvard University	11
Indiana University at Bloomington	11
University of Hawaii	11
New York University	8
University of Colorado	8
Ohio State University	7
Case Western Reserve University	6
Stanford University	6
University of Nebraska	6
Iowa State University	5
Texas A&M University	5
University of California at Santa Barbara	5
University of Chicago	5
University of Delaware	5
University of Tennessee	5
Washington State University	5
Washington University	5
Western Michigan University	5
Brigham Young University	4

Dartmouth College	4
Eastern Michigan University	4
Honeywell, Inc.	4
Illinois State University	4
Michigan State University	4
University of Kentucky	4
University of Oklahoma	4
Boston University	3
California State College at Hayward	3
California State College at Long Beach	3
Florida State University	3
Kent State University	3
Mississippi State University	3
University of California at Irvine	3
University of Florida	3
University of Illinois at Chicago Circle	3
University of Iowa	3
University of Michigan	3
University of Missouri at St. Louis	3
University of Pittsburgh	3
University of Southern California	3
University of Utah	3
Yale University	3
Adelphi University	2
American Institutes for Research (Palo Alto)	2
Boston College	2

Brown University	2
Carnegie-Mellon University	2
Columbia University	2
Columbia University--Teachers College	2
Cornell University	2
Drake University	2
George Washington University	2
Georgia Southern College	2
Humboldt State College	2
Indiana University of Pennsylvania	2
Marquette University	2
Medical University of South Carolina	2
National Bureau of Economic Research	2
New Mexico State University	2
Northwestern University	2
Oakland University	2
Purdue University	2
Rockefeller University	2
Rutgers University	2
Sacramento State College	2
State University of New York at Albany	2
State University of New York at Buffalo	2
State University of New York at Fredonia	2
State University of New York at Stony Brook	2
Temple University Medical School	2
Tougaloo College	2

Tufts University	2
University of California at Riverside	2
University of Detroit	2
University of Houston	2
University of Missouri at Columbia	2
University of Nevada	2
University of North Dakota	2
University of South Carolina	2
University of Washington	2
University of Wisconsin at Milwaukee	2
Wayne State University	2
West Chester State College	2
Western Carolina University	2
Wisconsin State University	2
Alabama A&M University	1
American Institutes for Research (Washington, DC)	1
Austin (Texas) State School	1
Bowdoin College	1
Bowman Gray Medical School (Wake Forest University)	1
Bucknell University	1
California State Colleges	1
California State College at Los Angeles	1
California State Polytechnic University	1
Calvin College	1
Catholic University of America	1
Central College	1

Clemson University	1
Colgate University	1
Colorado State University	1
Converse College	1
DePaul University	1
East Stroudsburg State College	1
Eastern Kentucky University	1
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Hampshire College	1
Illinois Institute of Technology	1
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Indiana University at Fort Wayne	1
Indiana University Southeast	1
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Kansas State University	1
Lake Forest College	1
Lawrence University	1
Lewis and Clark Community College	1
Loras College	1
Louisiana State University	1
Lynchburg College	1
Malcolm Bliss Mental Health Center	1

Mansfield State College	1
Midwestern University	1
Mills College of Education	1
Monticello College	1
Moorhead State College	1
National Assessment of Educational Progress	1
Oregon State University	1
Princeton University	1
Rice University	1
St. Lawrence University	1
St. Norbert College	1
San Jose State College	1
Smith College	1
Southwestern State College	1
State University of New York College at Brockport	1
State University of New York College at Buffalo	1
State University of New York College at Geneseo	1
State University of New York College at Oneonta	1
Syracuse University	1
Tarkio College	1
Tulane University (Newcomb College)	1
Tuskegee Institute	1
University of Alaska	1
University of California at Los Angeles	1
University of California at San Diego	1
University of Connecticut	1

University of Dayton	1
University of Denver	1
University of Georgia	1
University of Hawaii at Hilo	1
University of Illinois at Champaign	1
University of Kansas	1
University of Minnesota	1
University of Mississippi	1
University of Montana	1
University of New Mexico	1
University of Oregon	1
University of Pennsylvania	1
University of Rhode Island	1
University of South Dakota	1
University of South Florida	1
University of Texas at Arlington	1
University of Wisconsin Medical Center	1
University of Wyoming	1
Utah Speech and Hearing Center	1
Vanderbilt University	1
Virginia Commonwealth University	1
Virginia Polytechnic Institute	1
Washington and Lee University	1
Washington College	1
Weber State College	1
Wesleyan University	1

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Western Washington State College	1
Wichita State University	1
Williams College	1
Wofford College	1

COMMITTEE ON BASIC RESEARCH IN EDUCATION

SMALL GRANT PROGRAM

APPROVED PROPOSALS

RECOMMENDED TO

THE U. S. OFFICE OF EDUCATION

1970-1971

SGP NO.	PROPOSER AND ORGANIZATION	TITLE	DURATION	RECOMMENDED GRANT
311	ANDERSON, Barry D. Washington University	School Bureaucratization and Student Achievement	5/1/71- 4/30/73	$12,995
445	ANGLIN, Jeremy M. Harvard University	Studies in Semantic Development	5/1/71- 4/30/73	$12,942
264	BATCHELDER, William H. University of California, Irvine	Measurement Systems Viewed as Cognitive Structures	5/1/71- 4/30/73	$13,000
075	BRAUD, William G. University of Houston	Studies of the Stimulus Specificity, Response Specificity, Process Specificity, and Task Specificity of the Behavioral Bioassay Phenomenon	6/1/71- 5/31/73	$13,000
131	DANA, James D. Lawrence University	Demand for Private Higher Education in the 60's	5/1/71- 4/30/73	$12,745
130	DUSEK, Jerome B. Syracuse University	An Investigation of Adult Expectations as they Affect Children's Learning and Performance	6/1/71- 5/31/73	$12,987
080	ENIS, Peter State University of New York at Buffalo	Linear Discriminants Which Minimize the Probability of Misclassification	5/1/71- 4/30/73	$13,000
093	EPSTEIN, Erwin H. University of Wisconsin	Education and American Colonialism in Cuba, 1898-1909	6/1/71- 5/31/73	$12,992
118	FORWARD, John R. University of Colorado	Factors Inhibiting the Transfer of Control in Educational Settings	6/1/71- 5/31/73	$13,000
354	FREDERIKSEN, John R. Brandeis University	Perceptual, Judgmental, and Linguistic Factors in the Recognition of Masked Auditory Stimuli	5/1/71- 4/30/73	$12,993
252	GALE, Richard P. University of Oregon	Training Keepers of the Environment: The Professional Socialization of Architecture Students	5/15/71- 5/14/73	$13,000

SGP NO.	PROPOSER AND ORGANIZATION	TITLE	DURATION	RECOMMENDED GRANT
327	GROEN, Guy J. Carnegie-Mellon University	Basic Processes in Simple Problem Solving	5/1/71- 4/30/73	$13,000
428	HALL, James W. Northwestern University	The Development of Memory-Encoding Processes	5/1/71- 4/30/73	$12,948
344	HANNAN, Michael T. Stanford University	Societal Development and the Expansion of Educational Systems	5/1/71- 4/30/73	$13,000
010	HARDGRAVE, Robert L., Jr. University of Texas, Austin	The Politics of Bilingual Education	5/1/71- 4/30/73	$12,000
159	HAZLETT, J. Stephen University of Texas, Austin	Conceptions of Democratic Education in the Founding of the French Third Republic (1870-c. 1905)	6/1/71- 5/31/73	$12,000
390	HOPKINS, Ronald H. Washington State University	The Encoding of Verbal Information	6/15/71- 6/14/73	$13,000
324	HORNER, Matina S. Harvard University	Success Avoidant Motivation and Behavior: Its Developmental Correlates and Situational Determinants	5/1/71- 4/30/73	$12,969
306	KANTER, Rosabeth Moss Brandeis University	Commitment as a Function of the Organization of Educational Programs	5/1/71- 4/30/73	$12,900
108	KAHN, Robert K. STEINBERG, Danny D. University of Hawaii	English Phonology and Orthography	5/1/71- 4/30/73	$12,991
136	LEICHT, Kenneth L. Illinois State University	Role of Teacher Structuring and Student Structuring of Learning Materials in Student Learning	5/1/71- 4/30/73	$12,689
365	LIGHT, Donald W., Jr. Princeton University	A Sociological Theory for Understanding Changes in Youth	5/1/71- 4/30/73	$12,995
455	MARSHALL, Richard L. Michigan State University	Assessment of Cognitive Strategies and Cognitive Styles in Problem Solving and Learning	5/1/71- 4/30/73	$13,000

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155	MATTINGLY, Paul H. New York University	The Origins of Professional Schoolmen, 1820-1900	6/1/71- 5/31/73	$13,000
418	MC CONKIE, George W. New York State College of Agriculture Cornell University	Identifying the Span of the Effective Stimulus in Reading	5/1/71- 4/30/73	$11,437
021	MEDIN, Douglas L. Rockefeller University	Learning to Learn in Children	5/1/71- 4/30/73	$13,000
060	MEZEI, Louis L. University of Detroit	The Development of Time Perspectives as Functions of Race, Integrated School Attendance, and Socio-Economic Class Between the Ages of 11 and 17	5/1/71- 4/30/73	$13,000
152	PERRUCCI, Carolyn C. Purdue University	Socialization and Social Control Among Women in the Professions	5/1/71- 4/30/73	$12,938
357	RATLIFF, Richard G. University of Colorado	The Effects of Reinforcement and Developmental Stage on Learning in Children	5/1/71- 4/30/73	$13,000
346	ROBBINS, Michael C. University of Missouri, Columbia	A Cross-Cultural Study of Problems of Semantic Equivalence in Communication	5/1/71- 4/30/73	$13,000
227	ROMAN, Paul M. Newcomb College Tulane University	Career Adjustments Among Academicians During Middle Age	5/1/71- 4/30/73	$12,996
076	SEGAL, David R. University of Michigan	Higher Education as a Factor in Labor Force Mobility	5/1/71- 4/30/73	$13,000
055	SENF, Gerald M. University of Illinois, Chicago Circle	Modality Effects in Reading Disability	5/1/71- 4/30/73	$12,999
259	SIMPSON, Miles E. Stanford University	Education and Authoritarianism: A Mexican Study	5/1/71- 4/30/73	$12,963

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036	SOLMON, Lewis C. National Bureau of Economic Research	The Effects of School Quality on the Returns to Higher Education	5/1/71-4/30/73	$13,000
340	SNOWDON, Charles T. University of Wisconsin, Madison	Effects of Malnutrition and Heavy Metal Poisoning on Learning	5/1/71-4/30/73	$12,731
079	STINAFF, Russell D. Clemson University	Application of Computer Techniques to Instructional Research	5/1/71-4/30/73	$13,000
332	STRIKE, Kenneth A. New York State College of Agriculture Cornell University	A Study of the Conceptualization of Freedom in Psychology and Education	7/1/71-6/30/73	$12,984
224	SUZUKI, Nancy S. California State College, Long Beach	A Developmental Investigation of Sentenial Effects in Paired-associate Learning	5/1/71-4/30/73	$12,410
405	USEEM, Michael Harvard University	The Creation and Impact of Linkages Between the Social Sciences and the Federal Government	5/1/71-4/30/73	$12,960
369	WOLFORD, George L. Dartmouth College	Optimal Mixtures of Test Types in Paired-Associate Learning	6/1/71-5/31/73	$13,000

INDIVIDUALS ORIGINALLY SELECTED UNDER COBRE SMALL GRANT PROGRAM

WHO WITHDREW BECAUSE OF OTHER SOURCES OF FUNDING

PROPOSER AND ORGANIZATION	TITLE
ARMOR, David J. Harvard University	Effects of School Integration on Black Student Attitudes and Behavior
CLARK, Herbert H. Stanford University	Sentence Comprehension and Deductive Reasoning
FEATHERMAN, David L. University of Wisconsin	Timing of Education in the Life Cycle of Young Adults in Transition from School to Work
REYNOLDS, Allan G. Dartmouth College	Coding of Sentenial Information
TRIPLETT, Jack E. Washington University	Education and the Quality of Labor